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NICARAGUAN OR PANAMA CACAO AT THE EXPERIMENT STATION, PERADENIYA.

The following report from London Brokers received in reply to an inquiry made by the Director of Agriculture will be of interest to readers of the *Tropical Agriculturist* :—

Dear Sir,—Referring to your letter of 25th May, we now have the pleasure to give you Brokers' report on the sample of Cocoa, as under :—

"Fine to good Panama kind. If properly sized and not mixed with Ceylon plantation beans it would be worth about 100*s*. to 105*s*. per cwt.

"The sample, being mixed with small Ceylon plantation beans, would not fetch its real value in the present state. If properly sized and even bold it would sell very well. The bold beans are of fine break and even brown colour. The small red beans are of ordinary 2nd size plantation Ceylon kind of mixed break, and by themselves valued at about 72*s*. to 73*s* per cwt."

We enclose samples of the two kinds which ought to be kept separate.

Yours faithfully

GRAY, DAWES & CO.

London July 1st, 1912.

The variety of Cacao here referred to was received through the Government of Trinidad in 1895 under the name of Criollo or Cacao del Pays of Nicaragua. Thirteen trees bearing pods of three very distinct types were planted in the Peradeniya Botanic Gardens towards the end of the same year. The trees produced good crops in 1903-04 and in 1905 two acres of land were planted from their seed at the Experiment Station, Peradeniya, by Mr. Herbert Wright at the suggestion of the present writer.

The Nicaraguan Cacao at the Experiment Station.

This is now in bearing, and appears to have come quite true to the parental type. The plots unfortunately include a number of other types inadvertently planted amongst the true Nicaraguan, and it is to these

that the mixed sample referred to in the brokers' report is due. It is proposed to cut out these intruders at an early date and to replace them with the true Nicaraguan strain.

The essential features of the Nicaraguan variety—referred to in the trade, as it appears, as Panama—are as follows. The trees are of medium size with large leaves, and more or less intermediate in habit between the Forastero and Old Ceylon Red varieties. The pods are of a moderately large size and vary considerably in shape and colour and in the character of the surface, three well marked types occurring at Peradeniya.

Seeds.

But the most characteristic feature is the very large size of the seeds which excel in this respect those of all other known varieties. The cured seeds are about twice the weight of those of either the Old Red or Forastero varieties. They are oval in section and of the general shape of a good type of Forastero "bean," being less rounded than those of the Old Red. The average number of seeds in a pod is about 30. The testa or seed coat is very thin and delicate, and is somewhat liable to rub off from the dried beans, and the veining upon the dried seed coat is prominent. The colour of the fresh seeds as seen in section is variable. The most usual type is partly white but mottled and edged with bright crimson. Fairly deep purple seeds and pure white seeds also occur. The wall of the pod is thin and leathery, being almost devoid of the hard woody layer characteristic of Forastero varieties. Owing to the thinness of the wall, if pods of a similar size are taken belonging to the Forastero and Nicaragua varieties respectively the bulk of the seeds will be found to be considerably greater in the case of the latter.

The plots at the Experiment Station have suffered somewhat in the past from vicissitudes in the matter of shade treatment. They are now doing well and show at present only a moderate amount of susceptibility to the attacks of canker. The variety seems to be well worthy of a more extended trial in Ceylon, and it is hoped that during the coming season a few thousand pods will be available for distribution for purposes of seed. They will be obtainable on application to the Director of Agriculture at Peradeniya at the rate of 10 cents each. Not more than a thousand can be promised at present to any one applicant.

R. H. L.

MACASSAR OIL.

The lac tree (*Schleichera trijuga*) Kosumba, or the Ceylon Kon, occurs in the dry deciduous forests over the greater part of India, Burma and Ceylon. Macassar oil is the fat obtained from the seeds of this tree. Within the first few years there has been an extensive demand from abroad for these seeds, and they have been collected from Orissa under the name of Paka seeds. The seed consists of 40 per cent. shells and 60 per cent. of oil which is equivalent to about 36 per cent. of the nuts. The fat forms at the ordinary temperature a yellowish-white, buttery mass. Most samples of Macassar oil contain small quantities of hydrocyanic acid, probably liberated by the action of an enzyme on a cyanogenetic glucoside in the seed.—*Indian Trade Journal.*

REPORT ON DISEASE OF PADDY PLANTS AT AGALAWATTE.

I visited the infected fields on the morning of the 9th instant, and was shown round by Mr. F. D. Samarasingha, Mudliyar of Pasdum Korale East.

At the time of my visit, the insects had disappeared, but the areas that had been affected were rendered conspicuous by their brown colour, all the plants being dead and withered. I was unable to obtain a single living specimen of the insect, either on the dead plants or on the adjoining living plants.

By interrogating the Mudliyar and the local rice cultivators, I learned that the disease was first noticed about the beginning of July, when the stalks of the plants began to show a reddish tint. By the middle of that month, the stems were seen to be covered with insects—in various stages of development. This condition continued for about three weeks, by which time the plants were dead and the insects had disappeared.

No such pest had been observed in the locality before. There had been promise of a record crop, until this pest appeared. Many fields, and large patches in others, have been completely ruined.

The crop in one village (Kudaligama) is said to have been wiped out. The plants died before ripening the grain. It was noticeable that where patches only were attacked, these were strictly confined within the boundaries of their respective bunds, adjoining plots being entirely unaffected.

I am told that 3-months paddy suffered less severely than 5-months paddy, This may probably be accounted for by the maturing of the more rapidly growing plants before there had been time for the development of a second brood of the insects. The first brood would naturally be much smaller and less serious.

Recommendations.

Although no eggs were actually found, from the structure of the insect, which is provided with a strongly developed ovipositor, it is practically certain that the eggs would be embedded in slits in the stems or in the bases of the leaves.

The Pest having disappeared, for the time being, and the damage being complete, no remedial measures are now practicable. I have recommended that the stubble and dead plants on the affected plots should be burnt *in situ*, with a view to the destruction of any eggs that may be remaining in the stalks.

In subsequent crops, a careful watch should be kept for the earliest indications of a recurrence of the pest. It may be possible to destroy the first brood which will probably be confined to single plants or small areas, Such isolated patches might be destroyed by scorching them

with flaming torches. I know by experience that this insect is attracted by light. This fact might be utilized to destroy the migrating winged forms. by exposing flares—at night—in the affected areas.

As previously reported, I have identified the insect as *Nilaparvata greeni* (Homoptera). It is a common species in the Kandy district, but has not been recorded as a pest there. The species is known only from Ceylon.

In the event of continuous recurrences of the pest, it may be advisable to abandon—for a time—the cultivation of 5-months paddy, in favour of those varieties that ripen more rapidly.

I have requested the Mudliyar to collect further information and to report the exact area involved. A careful estimate of extent of the damage, with a valuation of the crop lost, would be useful.

E. ERNEST GREEN,
GOVERNMENT ENTOMOLOGIST,
R. B. G., Peradeniya, 12th Aug., 1912.

WORLD'S PRODUCTION OF SILK IN 1911.

H. M.'s Consul at Lyons (Mr. E. R. E. Vicars) has forwarded the following statistics, which have been published by the Lyons Silk Merchants' Syndicate, showing the estimated world's production of silk in 1911, together with the definite figures for the previous year :—

	1910.	1911. (Estimate.)
WESTERN EUROPE.	Kilogs.	Kilogs.
France	318,000	402,000
Italy	3,947,000	3,490,000
Spain	83,000	88,000
Austria-Hungary	352,000	355,000
Total ...	4,700,000	4,335,000
LEVANT AND CENTRAL ASIA.		
Turkey-in-Asia—		
Broussa and Anatolia ...	480,000	510,000
Syria and Cyprus	540,000	515,000
Other Provinces	130,000	135,000
Turkey-in-Europe—		
Salonica and Adrianople ...	360,000	365,000
Balkan States	175,000	195,000
Greece and Crete	57,000	65,000
Caucasus	520,000	480,000
Persia and Turkestan (export) ...	538,000	550,000
Total ...	2,800,000	2,815,000
FAR EAST.		
China—		
Exports from Shanghai ...	5,193,000	5,550,000
,, ,, Canton ...	2,637,000	1,690,000
Japan—		
Exports from Yokohama ...	8,935,000	9,200,000
India—		
Exports from Bengal and Cashmere	230,000	215,000
Total ...	16,995,000	16,655,000
GRAND TOTAL ...	24,495,000	23,805,000

Kilogs. = 2·2 lbs.

INSECT PESTS IN ZANZIBAR.

If we may judge by "An Account of Insects Injurious to Economic Plants in Zanzibar" (Leaflet No. 1, by W. M. Aders), that country may be reckoned as singularly fortunate. About thirty different pests are briefly described. More than three times this number have been recorded from the Tea plant alone, in India and Ceylon. Of those described, all but two or three occur in Ceylon, and would rank here as of minor importance. Zanzibar should be an Ideal Place for the establishment of strict quarantine regulations. Nearly all the more important insect pests of any country are introductions. Arriving without the natural enemies that preserve the balance of nature in their native country, they are at liberty to increase and multiply without hindrance. By subjecting all imported plants to fumigation before distribution, Zanzibar may long remain in the enviable position (as regards insect pests) in which it apparently now finds itself.

In describing the pests of the Cotton plant, mention is made of an Aphis which is said to be "about ½ an inch in length." If this figure is correct (which I can hardly credit), it must be a giant of its kind. Our largest Ceylonese Aphid measures approximately 4 milimeters, which is equivalent to about one-sixth of an inch.

Amongst the various recommendations for the destruction of 'white ants' (Termites,) I can find no mention of the 'Universal' Ant Exterminator, an appliance that was first brought to my notice by advertisements from South Africa. This handy and invaluable machine pumps the fumes of burning sulphur and arsenic into the nests, with most deadly effect.

At the end of the leaflet are given four formulæ for sinple insecticides. The author wisely confines himself to this small number, which is really sufficient for all practical purposes. His list consists of Lead Arseniate, Paris Green, Rosin Wash, and Kerosene Emulsion. Indeed, the number might have been reduced to three, without loss of efficiency, for Lead Arseniate serves all the purposes of Paris Green,—with better results.

For the rest, this pamphlet is written in clear and simple language, without needless technical detail, and should prove of service to local agriculturists and horticulturists.

E. E. G.

THE SCHOOL GARDEN.

A contributor to the *Gardener's Magazine* of July 6th writing about the school-gardens, says that the introduction of gardening as a subject in the school curriculum resulted from a conviction that our educational system was wrong inasmuch as it was not practical enough.

There is still in some quarters hazy ideas as to the object of school gardens.

It is not primarily to turn out professional gardeners though that may be a sequence, but it is intended to raise the general taste for gardening as a recreation and hobby, which is admitted to have an "uplifting effect." Another result of school gardening is that it teaches boys to work, to be handy and inventive. It also makes them take more interest in their natural surroundings, and in after life find a pleasure in rural life that a town life can never offer.

SANGUINARY INSECTS OF ZANZIBAR.

If Zanzibar is fortunate in the comparative paucity of its pests of economic plants, it appears to be well provided with blood-sucking insects of various kinds. As the author of this Leaflet (No. 2, "On the Blood-sucking Arthropods of Zanzibar harmful to Man or Stock," by W. M. Aders) remarks:—" The last twenty years have shown that these insects have a great significance as carriers of disease to man and domestic animals."

Of the various insects enumerated, by far the greater number are the two-winged flies (*Diptera*). It is remarkable that nearly all the insects provocative of disease come under this order, which includes Mosquitoes or *Culicidæ* (responsible for Malarial and Yellow Fever), 'Gad-Flies' or *Tabanidæ* (believed to be concerned in the communication of certain diseases of horses and cattle), 'Sand-Flies' of the genus *Phlebotomus* (agents in the dissemination of 'Papataci' Fever in Malta), 'Stable-Flies' of the genus *Stomoxys* (suspected of communicating 'Surrah' disease of horses), 'Tsetse Flies' or *Glossina* (agents in the transmission of the dreaded 'Sleeping Sickness' of Central Africa), 'Bot Flies' or *Œstridæ* (the cause of various tumours in cattle), and—last, but not least—the pestilential 'House Fly' (*Musca domestica*), which has been proved to be a prolific agent in the distribution of the germs of Typhoid Fever and other diseases of an allied nature.

Fleas (*Siphonaptera*), one or more species of which are concerned in the transmission of Bubonic Plague, are very closely allied to the Diptera and were formerly included in that Order.

The remaining blood-sucking insects belong to the order *Hemiptera*, as exemplified by the 'Bed-bugs' (*Cimicidæ*) and the 'Cone-nosed Bugs' (*Conorhinus*). A species of this latter genus has been shown to transmit a Trypanosome responsible for a serious and often fatal disease, in Brazil. *Conorhinus rubrofasciatus* occurs commonly in Ceylon, and has the sanguinary habits of its race (vide 'Trop. Agricult.', April 1910, p. 323), but no disease has—as yet—been traced to bites of our local species.

Ticks (*Ixodidæ*) are not true insects, though rightly included under the more comprehensive title of Arthropoda. They are well known agents in the transmission of several important diseases of cattle in South Africa.

E. E. G.

CEARA RUBBER.

Der Tropenflanzer for April 1912, p. 208, contains an abstract of an account of work carried out with *Manihot Glaziovii* in German East Africa, in which the results of the investigation permit it to be gathered that the branches of this tree contain quite 12·1 per cent. more rubber than the corresponding parts of a stem belonging to a tree which has branched high up, but that the cost of tapping is at least 30 per cent. greater. It is further admitted that no more favourable results are produced in cases where more branching exists than is found in the average tree.

LAYING OUT A COCONUT PLANTATION.

I arranged with some lowcountry men to plant up a portion of my land, $2\frac{1}{2}$ acres in extent, with coconuts, paying them 75 cents per tree (after 6 years) for the care and attention given by them during this period. They agreed to this on condition that I felled, burnt, fenced, drained and holed the land at my own expense, they then taking charge and planting the coconuts, the plants being supplied by me, they to have half share of any minor products planted by them,

Opening the Land.

The land was felled in February and March last year, costing me Rs. 15 per acre. The burning was done at the end of March, and was very successful, the season being dry. The whole burn was over in half an hour. The first shower of rain after several months came on that evening and this settled down all the ashes on the burnt land.

The next step was to remove all logs and timber that could be carried out, and for this work I contracted with a man to remove to one spot and cut up into yard lengths all logs that could be carried, paying 33 cents per yard for removal and cutting. This gave me 80 yards of firewood which I sold to the Mills at Rs. 1·50 per yard, transport costing 33 cents per yard. Balance left Rs. 67·20. Some good timber was sawn up costing Rs. 75. Value of timber Rs. 150.

The planters then cleared the land of all roots of small stumps that could be easily removed with a hoe. All this rubbish (nearly 40 or 50 cart loads) was put up in heaps and burnt in order to get the ashes. Then the land was lined for holing and drains cut where required, the drains being 3×4 feet at the top and 1 foot at the bottom, as the soil is a sandy one.

Catch Crops.

After the draining, holing and fencing were over, I directed that the land should be planted with yellow pumpkins (*wattaka*) alone, but as usual with the natives this did not satisfy them. They put down seeds of ash pumpkin (*puhul*), *karivila*, *wetakolu*, *diya-labu*, and *kekiri*. This took up more than half of the ground which in my opinion could have been more profitably used for yellow pumpkin alone. The following will prove this:—

Received from sale of	*wattaka* (yellow pumpkin)	Rs.	400·00
,,	*puhul* (ash pumkin)	,,	40·00
,,	*kekiri* (country cucumber)	,,	71·00
,,	*diya-labu* (bottle gourd) *karivila* (bitter gourd) *watakalu* (luffa) *bandaka* (okra)		91·00
		Rs.	602·00

	Date.	Rs. cts.	No. of Gourds wattaka.	No. of Gourds puhul.
August	1911	121·16	280	—
September	,,	121·27	300	23
October	,,	38·63	—	—
November	,,	222·15	1290	215
December	,,	77·18	—	—
January	1912	21·65	—	—
		602·04	1870	238

The pumpkins began to bear in August 1911. Owing to the drought the creepers were nearly dead in October, but the rain coming on in the end of October, fresh shoots were developed and in the end the crop was much larger than the first. The above accounts shew that even with the unfavourable weather we had in 1911, the proceeds, at the least, would have been Rs. 800/- if *wattaka* alone had been planted.

I should mention that the land was kept quite free from weeds till the creepers covered the ground.

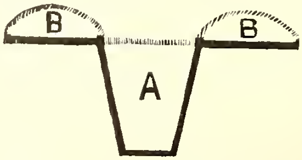
This land is now planted with plantains. The coconut plants were put down late last year and are doing very well.

When counting gourds for sale two small ones are counted as a large one, so that the number given in my list is not quite exact.

The Importance of Weeding.

There were as many plants of ash pumpkins as yellow put down, but they did not thrive; many of them were destroyed in the early stages and those that remained did not bear well. Half share of the amount realized went to the planters.

There is no doubt in my mind that the success I met with was mainly owing to the great care used in keeping the land free from weeds; also to my having removed all timber that would have prevented the creepers from running evenly over the ground, and to the formation of the drains—the earth removed being heaped along the edges prevented any of the surface soil and ashes being washed away when the rain came in (see diagram).



A. Drain.
B. Soil removed from drains heaped up.

CHAS A. ANDREE,
Kurunegala.

POULTRY NOTES.

(By P. A. V.)

Tuberculosis of fowls is very difficult to eradicate except by the adoption of drastic measures. The quickest and most effective method is to kill off all of the birds, disinfect the premises as thoroughly as possible and start with a new stock from a flock that is known to be free from disease. But in large flocks or where it is desired to preserve a certain strain in breeding all birds that show the least signs of illness should be promptly slaughtered and cremated, the healthy birds removed to new ground, new houses built and eggs for hatching secured from stock that is known to be healthy. If incubators are used the problem is made simple. Precautions should also be taken to prevent the possible infection of the fowls from bovine sources by the feeding of offal from slaughtered tubercular cattle or hogs or from human sources by picking up sputum carelessly expectorated on the ground by consumptive persons. New stock should be secured only from flocks that are known to be free from disease. An additional preventive is to increase and maintain the natural vigour of the fowls by care in breeding and feeding and housing in open-air houses.

Profitable Duck Farming.

Mr. H. V. Hawdins, Poultry Expert of the Victoria Department of Agriculture, Australia, puts in a vigorous plea in the last December Number of the Journal of the Department for more extended duck-farming which he states is very profitable. He gives a few hints in regard to handling ducks: (1) Do not attempt to catch the ducks by their legs: it is much safer to handle them by the neck; (2) Do not reduce their weight by taking a lamp amongst them at night; (3) Never throw dry lime in a duck pen: it kills; (4) Never select the largest duck eggs for hatching: they are usually infertile; (5) Ducks should always be locked in at night and kept on an absolutely dry, soft floor: they lay best under these conditions and the eggs are easily gathered; (6) Never hurry the laying ducks: it usually injures them, sometimes seriously; (7) When sickness attacks ducks, it is useless to doctor them: the best remedy for duck ailments is plenty of sliced raw onion in the mash and an absolutely dry, soft bed; (8) Ducks shoud never be permitted to run with fowls: they both do better in pens by themselves; (9) When fowls and ducks are allowed to drink from the same vessel, an outbreak of disease may be expected; (10) Birds with crooked backs, wry tails and similar defects should not be bred from.

Fowl-selection for Egg-production.

Comparatively little is at present known with regard to the biological factors which cause improved egg production or as to the laws according to which these factors operate. Empirical methods have led to a knowledge of how to feed, care for and. to some extent, breed fowls with a view to high egg production, but the biological laws underlying the process of egg production are still but little understood. A valuable contribution to the subject has recently been made by Dr.

Raymond Pearl and Dr. F. M. Surface based on experimental work at the Main Agricultural Experiment Station. It was found that the effect of selection on egg production was *nil*, taking into consideration the influence of environmental circumstances. As to these latter, the more the floor-space in the housing pen and the less the number of hens in flocks the greater the egg-production. This affects only the summer egg production.

Egg-Eating Fowls.

To test whether fowls are egg-eaters or not, put an egg in the run. Let it be a brown one if the hens lay brown eggs or a white one if a breed is kept which lays white eggs. When the bird notices the egg, if she only rolls it over with her beak, it is a pretty good proof that she is not an egg-eater but that she has sometimes helped the other hens to eat an egg. If they do not know the taste of an egg, they do not turn it over and the fact of their rolling it over is a proof that they expect to find a hole in it; these birds can really be called egg-eaters. Some hens will strike an egg with their cut beak or an egg filled in the way we have described and these are considered inveterate egg-eaters and should be killed. Feather pluckers should be treated in exactly the same way as by cutting their beaks they cannot hold the feathers to pull them out.

THE JUTE CROP OF ASSAM, 1912.

The Director of Land Records and Agriculture, Assam, reports on July 5th :—

On the average of the five years ending 1909-1910, the area under jute in Assam represents some 2·1 per cent. of the total area under jute in British India.—The rainfall in February was in excess in all districts of the Province except Goalpara and Garo Hills, where it was normal. It was excessive everywhere in March, and continued to be so in April, when it was about double the average in the four large jute-growing districts—Sylhet, Goalpara, Garo Hills, and Kamrup. But in May rain was in defect everywhere, especially in the larger jute-growing areas. In June rainfall was normal with a slight tendency to defect. The weather was thus not favourable at the time of sowing to excessive rainfall, and tended to diminish the area that would have been put under jute: weeding was also hampered by the same cause. Though the unfavourable conditions at the beginning changed for the better, the general condition of the crop is not as good as last year.

According to the estimates of District Officers, the total area under the crop this year amounts to 106,853 acres, against 90,700 acres in 1911, or an increase of nearly 18 per cent. Goalpara reports an increase of 18,000 acres, or nearly 50 per cent., which is attributed to the influx of cultivators from Bengal, but in Sylhet there is a decrease of 3,000 acres on account of the unfavourable weather: in Garo Hills, there is a slight increase, in Kamrup one of about 8 per cent.: the area in the remaining districts is trifling, and shows an improvement in Darrang only.

Stocks.—The quantity of jute in stock from last year is reported to be very small.

BULLETIN OF THE IMPERIAL INSTITUTE.

This Bulletin was first published in 1903. It appears quarterly and contains:—reports on investigations conducted in the Scientific and Technical Department of the Imperial Institute; articles and notes dealing with mineral and vegetable economic products; and a quarterly summary of information on recent progress in agriculture and the development of Natural Resources.

Until this year the "Bulletin" has been published by the Imperial Institute, but owing to the increased demand for it its publication has now been undertaken by Mr. John Murray, 50a Albemarle Street, London, W., and the first number of the new series has appeared.

Contents of First Number.

The principal contents of this first number are as follows:—

Rubber resources of Uganda; Some cotton soils of the Nyasaland and Uganda Protectorates; Kola nuts from British West Africa; Coca leaves from Ceylon and the Federated Malay States; Aromatic grass oils, Part III; Hibiscus fibres from the Northern Territories, Gold Coast; Timber from Uganda; Sumach from Cyprus; Economic products from Mauritius; The coconut and its commercial uses, Part I; Cultivation, preparation and utilisation of hemp and hemp seed *(Cannabis sativa)*; Cultivation and preparation of ginger; Agricultural work in Seychelles; Candelilla wax, Sisal hemp in Quilimane; New Zealand hemp; Iron ore from Trinidad; Copper-mercury ore from Queensland; Native labour regulations in Mozambique.

Second Number.

The second number now published has the following principal contents:

Tobacco industry of Ceylon; Some new gutta yielding plants from the Gold Coast; *Ficus elastica* rubber from Southern Nigeria; "Balata' rubber (*Ficus Vogelii*) from Southern Nigeria; The rubber of *Cryptostegia Grandiflora*; Silk from India; Cotton and Sisal hemp from Papua (British New Guinea); Fibres from India; Utilisation of *Cæsalpinia digyna*; Oil-seeds of *Telfairia pedata*; *Lophira* oil-seeds from West Africa; Oils and oil-seeds from Hongkong; West African cocoa; The cultivation of cigar tobacco with special reference to Java; The coconut and its commercial uses, Part II; Shea nuts and Shea butter; Rubber tapping experiments in Southern Nigeria; Economic developments in the Belgian Congo; West Indian satinwood; Oil of "Nepal" Camphor wood"; Citronella grass; *Mesembrianthemum Mahoni* roots from the Transvaal; Rubber Exhibition in Java; Cultivation of fibres in Java; "Root-cotton"; Perilla seed and oil.

The annual subscription to the "Bulletin" is 10*s*. 6*d*. or 11*s*. post free; single numbers may be purchased at 2*s* 6*d*. each or 2*s*. 9*d*. post free. Subscriptions may be paid through any bookseller, or if no bookseller is available they may be sent direct to Mr. John Murray, 50a Albemarle Street, London, W.

THE LAND QUESTION IN BRITISH WEST AFRICA.

SPECIAL COMMITTEE APPOINTED.

In announcing the appointment of a Committee (with Sir Kenelm E. Digby, G.C.B., K.C., as Chairman), *The Times* publishes a statement of the situation in its issue of 26th June by its Special Correspondent lately in Nigeria :—

"In the pursuit of various occupations the natives roam over vast spaces. When the white settler comes upon the scene the demand for land necessarily follows and the immemorial habits of the native population are inevitably affected by the new element. Hence arise local difficulties, sometimes injustice, which it is the business of the legislator to set right. The legislator will be hampered on the spot by a type of white settler who contends that the native has no rights, and by a type of well meaning philanthropist at home who contends that the native has all the rights.

If the capacity of the West African Native as a Trader has become proverbial, his capacity as an agriculturist and planter, long denied by the ignorant, is now equally established. Setting aside the immense production of foodstuffs required for his own sustenance, the native has within recent years, with Government encouragement, busied himself in meeting the growing demand for tropical produce on the part of the Western world. Eleven years ago the native in Southern Nigeria was urged to grow cotton, cocoa, and maize for export purposes, and in that period, despite partial failures of the maize and cotton crops, the export has risen from £9,000 to close upon £300,000. While for various reasons the development in considerable proportions of the cotton industry is doubtful, and while the maize crop will always be fluctuating, depending as it does upon local requirements, cocoa is certain to increase largely. I have already given particulars in *The Times* of the remarkable extension in native plantation rubber cultivation which has followed the initiative of the Southern Nigerian Forestry Department. Here again we have a native industry which is only in its infancy.

Agricultural Developments.

In the Gold Cosst and Ashanti agricultural development in the matter of cocoa cultivation has been simply wonderful—there is no other word for it. In less than 20 years the Fanti farmer, now joined by his Ashanti colleague (but yesterday a fighting man and nothing else, but now that fighting is at a discount bringing to peaceful pursuits his former warlike energies), has made of the Gold Coast the premier cocoa-producing country in the world, producing that article to the value of £1,000,000 sterling; beating the West Indies and the Dutch East Indies and beating São Thomè. A triumph of the economic superiority of free labour over

indentured labour on the one hand, and slave labour on the other, is perhaps the most striking object-lesson now available to the study of what the West African occupying and using his land under the tribal system of communal tenure and working for himself and his family can accomplish.

In short, not to give further illustrations, we have in West Africa a fund of native agricultural, commercial, and industrial activity whose expansion is only limited by accessibility to markets, by population, and by technical knowledge.

Encouragement of Native Occupation.

Such being the conditions in West Africa, it is obvious that the land question presents itself under totally different aspects than is the case in East Africa or South Africa. In West Africa, where the whole future of the native races is bound up with their unfettered enjoyment and usage of the land. there can be no question of native "reserves." The first duty of Government as trustees for the native races is to prevent interference with the native occupation of land; to provide legislative safeguards against any processes which may tend to alienate the land from future generations or to cripple the free economic expansion of its inhabitants. This is no matter of "Sentimentalism," but of elementary justice and, too, of elementary statesmanship and sound economics.

It is the obvious interest of Government that native wealth should increase, for the increase of native wealth means the increase of the purchasing capacity of the native and the consequent increase in revenue. That is the first law of West African economics. West Africa, as Mary Kingsley so ably urged, is a "trade" country primarily. The normal expansion of commerce involves assistance and encouragement to the European merchant to carry out his legitimate business with the *minimum* of restrictions. It involves assistance and encouragement to the native to develop his land and its resources. Both parties to this commercial intercourse have a common economic interest, which is shared by the manufacturing and working classes of Europe.

The Law of Tenure.

Informed public opinion has been steadily tending towards these conclusions for some years past and has received increasing support from the Colonial Office and from the most experienced officials in West Africa. Readers of *The Times* are aware that the first step in the direction indicated was sanctioned by the Colonial Office last year as regards Northern Nigeria after an exhaustive investigation into the customary law of tenure there prevailing, initiated by Sir Percy Girouard and afterwards carried to a Special Commission which sat in Downing-street. But in the rest of British West Africa the problem still awaits treatment, and will require careful and prudent handling. In Northern Nigeria action was, politically speaking, of relative simplicity. When we overthrew the Fulani Emirs after their refusal to negotiate with us we became the supreme over-lords of Northern Nigeria. It was a clean slate upon which we wrote, and, happily, we wrote well. Elsewhere work, perhaps inevitably, has been patchy, contradictory, and rather inspired by an attitude of *laissez-faire* than by any clear guiding principle, with the result that to-day a complicated knot requires unravelling.

BANANAS AS FOOD.

MR. WILLIAM FAWCETT, B. Sc., F. L. S., writes to the *West India Committee Circular* :—

In considering the claims of any substance, whether animal or vegetable, to be used as a food, it is necessary to ascertain whether it contains the chemical elements needed by the body to repair the waste of the tissues, and to supply energy for the production of heat and for the work done in and by the body. These elements are known as proteins, carbohydrates, fats, and mineral matter. As general examples of proteins, the following substances may be quoted: Muscle or lean of meat, casein (or cheesy matter) of milk, egg, gluten of flour. Proteins alone can supply the nitrogenous material necessary for the formation of tissues. The carbo-hydrates include such compounds as starches and sugars, and their more important function is to supply energy to the body to meet its requirements above that which it may obtain from the proteids. The fats are digested with scarcely any waste, and supply energy like carbohydrates ; so that the amount of either of these two elements may vary largely according to taste so long as the total amount of both is sufficient. Besides ascertaining the composition of a food-substance, its digestibility should be considered as well as the amount of work that has to be expended in preparing it for the stomach.

Composition of Banana Fruit.

Atwater and Miller, in an article on Dietetics in the eleventh edition of the Encyclopædia Britannica give the following percentage composition of bananas :—refuse 35·0, water 48·9, protein 0·8, fat 0·4, carbohydrates 14·3, mineral matter 0·6. Now, if the peel is removed from the fruit, representing the refuse 35 per cent., and allowance made for the water, it will be seen that the banana contains a notable quantity of all the necessary elements of food.

The fruit may therefore be considered a highly nutritious food. It is also easily digestible—the time occupied in digestion is small compared with that of other foods, as the following times indicate: roast beef 3 hours 20 minutes, stale bread 3 hours 40 minutes, apples 2 hours 30 minutes, bananas 1 hour 45 minutes.

The thick skin of the banana is a perfect protection against contamination of the fruit. It cannot be eaten like skin of the apple or the plum and when removed, the fruit may be eaten without fear of dirt or germs, even when it comes off the least inviting of costers' barrows—besides there is no core or stone to slip down unawares.

In the course of a speech on his return from a visit to Jamaica, Sir James Crichton-Browne, M.D., said: "I wish all our school children could have bananas from time to time. . . . The banana is not a flavoured fruit, that is to say, a little sugar and water with a drop of some essence thrown in, but a food fruit containing, in an agreeable form, all the essential elements of nutrition . . . As an adjunct to our other foods it is of great value, being at once acceptable to all—for it is not an acquired taste—giving variety to the domestic diet, and mingling well with other comestibles. . . . .

Banana Flour.

Banana flour is made from the unripe banana, that is, before the starch is changed into sugar in the ripening. It is difficult to peel green bananas but if they are first put into scalding water (176° F.) for four or five minutes, the peel is easily removed. The peeled fruit is dried in the sun or put into a dryer of some kind to reduce the percentage of the water which they contain from 70 to 15. The drying is more readily effected if the fruit is cut up small. Steel knives should not be used as they turn the banana black ; nickel blades are better. In the factory at the time in operation at Montpelier, Jamacia, beloning to the Hon. Evelyn Ellis, the bananas were dried in a vacuum, the interior of the vacuum apparatus being heated. The bananas enclosed in this dryer were stirred continuously by means of paddles which alternate and move between fixed knives. The paddles were moved by a system of belts and pulleys. The vacuum was only a slight reduction of the atmospheric pressure. The drying was completed in two hours ; by this time the bananas had been reduced to the appearance of somewhate coarse flour with only 15 per cent. of water. The mass was removed from the dryer and passed through sieves containing 120 meshes to the square inch. Whatever remained on the sieve was passed through a simple mill and sifted afresh. The flour was packed in boxes or barrels lined with paper. The odour was that characteristic of the fresh banana, the flavour agreeable and the taste somewhat sweet.

The chemical composition of the flour manufactured at Montpelier was given as : Water, 15 per cent.; starch and dextrine, 73·92 per cent.; fatty matter, 1·14 per cent.; albumen, 3·37 per cent.; fibre, colouring matter, tannin, 4·70 per cent.; ash (containing 25 per cent. of phosphoric acid),—1·96 per cent.

With liquids such as water, milk, broth, a mixture is obtained without dregs. It is an excellent material for making biscuits, but can only be made into bread by mixing with wheat flour.

The Lancet, February 1900, says :—"For some reason not yet explained, the starch of the banana is much more digestible than are the cereal starches, besides which the fruit contains a notable proportion of nitrogenous material."—*Indian Trade Journal.*

SUGARCANE IN ASSAM, 1912-13.

The Director of Land Records and Agriculture, Assam, reports on July 26th :—

On the average of the five years ending 1911-12 the area under sugarcane in Assam represents some 1·9 per cent. of the total area under sugarcane in British India. In Assam sugarcane is generally planted between the middle of March and the Middle of May. Excessive rainfall at the time of planting hindered cultivation to some extent, but the weather has since been favourable for the growth of the crop.

The area planted is returned by the District Officers as 34,200 acres against 34,700 acres planted last year. Decreases occurred in Sylhet, Kamrup, Nowgong and Lakhimpur, but there was some increase in area in Cachar, Darrang and Sibsagar.

District Officers estimate the probable outturn per acre as 97 per cent., or a little above that estimated last year. The crop promises well, but it is too early now to estimate the outturn accurately.

GUINEA GRASS.

The following is a summary of an account of the cultivation of Guinea Grass (*Panicum maximum*) in the *Agricultural Journal of India*:—

(1.) It is a quick-growing grass as it yields in 45 days a cutting 6′ to 8′ high, weighing 14 tons on the average per acre.

(2.) It yields the largest quantity of grass known in a given time from a given area.

(3.) It is highly nutritious and is useful for feeding all kinds of stock.

(4.) It is a real perennial and occupies the ground for at least a generation without requiring change.

(5.) It is the least expensive to grow, with no costly seed bill to start with, no weeding and very little interculture.

(6.) It is the best fodder plant for intensive cultivation as it yields a quantity of fodder which we cannot hope to get from eight times the area of juari at double the cost. It is a most hardy and drought-resisting fodder plant, useful in times of scarcity.

(7.) It is free from pests and fungus diseases to which lucerne and other fodders are liable.

(8.) It always yields a good return to a cultivator, whose object is sale of fodder.

Returns.

From a commercial standpoint, the cultivation of guinea grass is a profitable undertaking. As stated above, each acre yields, during the year, 100 tons of green grass which, sold at the rate of 300 lbs. a rupee, fetches about Rs. 800. Where tank or river water is available for irrigation, the growing of guinea grass is exceedingly easy, the only expensive item being manure. Guinea grass requires frequent manuring with sewage, night-soil, sheep-dung and bonedust in large quantities. Well-rotted conservancy rubbish and cow-dung can also be freely used in the absence of the above. It never costs me more than a hundred rupees per acre to get the maximum yield. There is considerable profit in growing guinea grass, near all muncipal towns where demand for green grass always exists. For private use of ryots in villages it is enough to have one acre under guinea grass for every 25 head of cattle, and for dairy farmers whose cows would have to depend almost solely on guinea grass, one acre is necessary for every ten milch cows.

CAPE GOOSEBERRY.

Physalis Peruviana. (*Solanaceæ*), Cape Gooseberry; Peruvian Cherry. —A small herbaceous perennial, native of Peru, naturalised at the Cape and to some extent in the Hill districts of Ceylon. The fruit is of the size and form of a small cherry, and is concealed in the dry, leafy, persistent calyx. When quite ripe it is of an agreeable and refreshing flavour, and may be used for dessert or for making jam or preserves. In South Africa it is largely made into jam, which forms an article of export there. The plant is easily raised from seed, and will thrive in any ordinarily good soil, but is most productive on rich sandy soil. Sow in sheltered beds, and plant out seedlings about 18 inches from each other in rows 3 feet apart. Suited to intermediate rather than high elevations.—*Macmillan.* (*See Illustration.*)

Photo by H. F. Macmillan.

CAPE GOOSEBERRY.

THE COCONUT PALM.

PAPER BY MR. A. KARL BEVEN.

[Read before the Low-country Products Association.]

A Brief History of the Industry.

Coconuts are recognised even by those who have staked their all in tea, and even rubber, as being the safest investment the Island offers. The cultivation covers a large field, and I shall attempt to touch only lightly on it, in the hope that attention may be directed to the more important phases of the growth and cultivation of the palm. Coconuts are not indigenous to Ceylon. A great authority on the subject places their original habitat in the Eastern Archipelago. In Ceylon tradition locates the earliest groves in the Southern Coast. But it is supposed to be only after the arrival of the Dutch, about the year 1656, that a great stimulus was given to the extension and cultivation of the palm.

The principal Coconut-Growing Regions.

These extend now along the North-Western, the Western, and Southern Coasts of Ceylon; also in the Jaffna Peninsula in the North and in the Eastern Province, the Batticaloa district. In the last mentioned a serious blow was given to the industry by the cyclone of March, 1907, which almost extinguished it on a part of that coast. That event is fresh in our minds. Inland, the extension has been considerable in the North-Western, the Western, and the Northern Provinces. Then there are portions of the Central Province where it flourishes around Peradeniya, Gampola, Kandy, and Matale. At Badulla there is a good coconut garden flourishing at 2,000 feet elevation; but this lies in a well-sheltered valley.

Area Cultivated.

In 1860 there were 250,000 acres under cultivation and now, 52 years later, we have over 929,000 acres. The energy and enterprise which have produced such a rapid extension are obvious; and great credit is due to those who have engaged in it, having regard to the slow growth of the palm and the difficulty of handling its bulky products. It is an enterprise which deserves greater assistance from Government than has been given to it. I refer to the facilities that ought to have been extended to it by the opening of railways into coconut districts. How small a proportion of this vast acreage is served by a railway! It was pointed out not long ago that it was when coffee covered an extent of only 150,000 acres it had a railway given for its special benefit. Remember it was a most difficult and expensive line to construct, and it was planned when the acreage was only 80,000! Yet, now, there are over 250,000 acres of flourishing coconuts under cultivation in the Marawila district and in parts of Chilaw, Rajakadaluwa and Puttalam—and inland to the outskirts of the Kurunegala district included—still awaiting a railway which has been agitated for over the last 25 years. It is a remarkably cheap line to construct, yet the enterprise was attempted to be smothered by every possible obstacle—some real but not insurmountable, and others imaginary that only perversity could conjure up. It was here the Low-country Products

Association seized the opportunity to justify its existence and secured sanction for the railway beyond Negombo, but alas! only to Chilaw. It is in pressing the claims of the low-country products to the same consideration as has been shown by Government to up-country products that this Association may yet earn the gratitude of the Ceylonese planting community.

Selection of Ground.

Coconuts are supposed to grow anywhere and everywhere, but it is a mistaken idea. The object of most capitalists is to get as quick returns as possible from land at a minimum of expenditure. But the palm is not a product suited for acquiring rapid fortunes: those who can afford to wait will be rewarded for their patience. For the successful growth of coconuts an average temperature of 80° is reqnired; and an average and even distribution of 70 to 100 inches of annual rainfall is essential where the soil is stiff. In the Chilaw and Puttalam districts, a free soil and the presence of water near the surface enable the palm to thrive with a much scantier rainfall. In some of the higher districts, with an abundant rainfall coconuts grow, but a low temperature and excessive moisture hinder the production of fruits. Next to rainfall and temperature attention must be directed to the nature of the soil. The best, of course, is to be found in alluvial flats and along the banks of the rivers, where the land is periodically flooded for a few days. But land under these conditions is not plentiful. The next best soil is a sandy loam. There are many others on which the palm thrives and the richer and deeper the soil the less will be the subsequent expenditure in maintaining its fertility. The only two soils on which the palm—unless heavy expenditure is to be faced—refuses to grow profitably are hard gravel and stiff clay. The latter is the worst to deal with, and one I would avoid altogether. Trees on the former. however, to my knowledge, have responded to cultivation and can and will yield profitable returns.

Selection of Seed Nuts.

The next subject to engage attention should be the selection of seed nuts. It is of paramount importance that the greatest care be taken that only the best nuts be got for seed. Time, trouble and expense should not be grudged, for a great deal of the future of the plantation depends on the trees from which the seed nuts have been chosen. I should choose nuts from trees ranging from 20 to 50 years of age. That is those in their very prime. The tree should present a vigorous growth and have large crowns carrying the bunches of fruit on well-set short stems. It is well to avoid those trees that show a tendency to drop their nuts, however larger or numerous, and those with scanty or drooping fronds. There is a prejudice in favour of a large sized nut, but I prefer those of a medium size, since one has to take a commercial view of the product. Where the nuts are exceptionally large, it follows that there would be fewer on a bunch than where the nuts are of medium size. The difference in numbers when acres are considered will be very considerable, as nuts are sold by the thousand, only very small ones being rejected. In weight, too, if you turn your nuts into copra, there is a great advantage, considering their numbers, in medium over large nuts. I would choose therefore medium-sized nuts globular in shape and with a thin husk and a thick kernel for the nursery.

The Nursery.

The method of laying out the nursery is known to most of us. But I would emphasize the need of special precau tions to avoid a

site in which white ants are likely to show themselves, or one with too dense a shade. The latter causes the plants to be "spindley." These feel the shock when planted out in the open. There are two methods of laying the nuts in the nurseries—horizontally—the position they lie in when fallen from a tree—and vertically with the "eyes" up. The latter system I do not favour, as the retention of water in the depression, at the stalk end, when the nut is in the upright position, is liable to cause rot, to which the germ, directly below it, may succumb. When laying the nuts on their sides, do not bury them deep. They should be only half covered; and both now, and when planting them out later *in situ* let the stalk end be kept slightly above ground. The husk toughens and offers some resistance to white ants; but if they are in the nursery they secure a lodgment and give no hope to the plant in the field. If the stalk end, which is the tender spot, is above ground, the mischief can be easily detected. It should be wise to reject those plants tardy in shooting out or springing up.

Lining.

Strict accuracy should be shown here, not because a plant out of line by a foot or two would suffer, but because the appearance of the field would be spoilt, and the field would remain a monument of slip-shod work. I advocate the usually adopted distance 25 ft. × 25 ft. apart, and would avoid planting any closer, but in a very damp district 30 ft. × 30 ft. would perhaps be more suitable both to provide for the rapid spread of the fronds and to secure heat and sunlight for the soil.

Holing.

This should be carefully attended to, and every effort should be made to give the plant a good start. Nothing less than 3 feet square and a depth of 3 feet should be provided. Coolies, when holing in undulating land, will persist in throwing all the earth on the lower side. It is well-known that the richest soil is on the surface. Care should therefore be taken that at least the first 12 to 15 inches of soil be dug out and heaped on the lower side of the hole; the remainder banked up in a semicircle on the upper side.

Planting Out.

When the time comes for planting out the plants should have at least four leaves—the hole should be filled up to within 12 to 15 inches of the surface with the richer soil and a basket of ashes, if available. A secondary advantage of the soil being banked up on the upper side is that it would prevent a rush of water into the hole and the consequent displacement of the plant. It is now one of the advantages of planting the nuts on their sides in the nursery comes in. When planted out, to prevent the plants toppling over through wind or rush of water, two short stakes should be driven in cross-wise over the nut and these keep it firmly in its place. Where there is excessive moisture, it is necessary to cut drains between the rows to carry off the water that may accumulate and stagnate, and also from the holes that are liable to fill. Avoid what one sees frequently done—the dumping down of plants in deep holes, in which sufficient soil has not been put in. The roots should be cut with a sharp knife before the plant is put down, and they should not have to fight their way into hard soil.

Pests.

In the first stages of growth and until the plants have taken a hold of the soil and are independent of the nourishment they derive from the kernel and the husk, the chief difficulty that besets the planter is the destruction caused by white ants.

An application of salt is beneficial, and so is the planting of an aloe seedling by the stem of the plant. The sprinkling of a handful or two of fresh jak or lunumidella saw-dust is also effective. But, perhaps, the easiest and surest remedy is the application of a solution of corrosive sublimate on the husk—say a tea-spoonful to a bottle of water.

During the first five years, the wary bandicoot, rat and porcupine prove yet more serious enemies. The damage done by them is all the greater, because they do not appear on the field until the plant is, to a certain extent, advanced in growth. The porcupine perfers to make a meal off the plant just when it shows a stem above ground. My experience of the bandicoot, waiting until the plants are 4 or 5 years of age to begin their destruction, may be exceptional; but in a field of 7¼ acres, no less than 150 plants were destroyed within a few weeks. The field was under cinnamon at the time.

Protecting Plants.

Nor would it be out of place to urge the necessity of taking steps to protect plants, during the first five years of their existence, from the attacks of cattle. They do a tremendous amount of damage—the growth of plants eaten down by them is seriously retarded; and such plants will seldom thrive and develop into good trees. Badly attacked plants should be rooted up and replaced if possible by plants of the same age as those in the field. The advantages of cattle on a plantation are great, but it is not advisable to bring them on to the land until after the plants are free from the danger of their attacks. No pains should be spared to protect plants during the first five years against the bandicoot, the porcupine and cattle, for it is of paramount necessity that plants should be started in their growth under the most favourable conditions.

Weeding and Green Manuring.

The plants themselves need practically only the clean-weeding of a circle of say 5 feet in diameter. The application of wood ashes proves beneficial to plants and a mulch of green manure. Between the rows of plants I would only cut down the brushwood, and in order not to expose the ground to the full force of the sun, the growth of some leguminous plants offers a double advantage in enriching the soil as well. A great object should be to maintain the richness of the soil, remembering that the roots of the palms are wide-spreading and surface feeding; and when the trees grow up they will require all there is to be had. The future welfare of the tree will be greatly helped by conserving the richness of the soil. Green manures can always be grown with advantage. There are soils which will not be impoverished, to the detriment of the palm in later years, by the growth of catch crops, but care should be taken tc chose such as are not too exhausting.

The application of manures on a system will not be necessary before the palm reaches the bearing stage, nor even in the first few years of bearing. The advantages of applying some manure to stimulate those plants that are backward are obvious. They need a helping hand and timely help should secure uniformity in the plantation. I shall not touch further on the all-important subject of manuring and on the great benefits to both trees and crop from the application of suitable manures. It is a large subject and the Association will, I hope, induce some other member to read a paper on it on a future occasion.

Trenching.

A regular system of trenching begun early would greatly benefit the trees. On steep land, contour trenching, before planting, would conserve soils. In the earlier years, it would be sufficient on ordinary flat or undulating land to have narrow trenches, say 2 feet wide and 18 inches deep between the rows of trees to hold up water and to prevent wash in the portions of the land that require them. But when the trees have developed, it would be advisable to have contour trenches, embracing every little rise in the land and throughout the undulating sections. Even where the surface is fairly covered over with grass, and the slope is hardly appreciable, a trench often reveals, after an average shower, an immense amount of moisture that would otherwise have run to waste, perhaps carried out of the land altogether. It is not only the water but the soil also that is often lost to the estate.

The first object in trenching should be to conserve as much moisture as possible on the higher portions. Then the wider the trenches lower down, the greater the superficial area of soil reached and the greater its porosity. It is usual to have trenches cut in sections say 20 ft. long 5 ft. wide, and 12 to 15 inches deep, the soil being banked up on the lower side. The advantage of having trenches cut in sections, with firm ground 2 ft. between, is that where they do not run at right angles to the slope they prevent all the water rushing to the lower end to accumulate there and probably burst the bund. It is to meet these two contingencies that the sections are of use, each section holding the water that comes from above it, to the benefit of the plants above and below. The bottom of the trenches should be as level as possible. If the trenches be gradually packed with husk, fallen branches and all the rubbish that can be collected, and finally receive a top-dressing of earth, the benefit will soon be realised.

A similar system of trenches carried on in alternate lines will help to cover the whole estate by degrees with a net-work of receptacles for moisture and manures within easy reach of every tree. Slowly but surely the entire surface soil will thereby be worked. Nor should the cost of these trenches be heavy, at least not to the practical planter who refuses to be guided by the contract rates which are paid by Government generally in their P.W.D., Railway, and Irrigation Works. I believe the rate is somewhere about 75 cts. to a rupee a cube. Now, I have had cut tens of thousands of feet of these trenches and have found a cooly able to cut three trenches, each 20′ × 5′ × 1′, or 20′ × 4½′ × 15″, in a day in a medium soil. The cost works out at only 12 cts. a cube. Task work is welcomed by the men, as the better workers find no difficulty in completing their trenches and striking work at 3 and 4 o'clock in the afternoon.

Vacancies.

These should be promptly filled up; and, if uniformity is to be preserved, it is well to have advanced plants in the nursery to take the places of the lost ones ; but vacancies mean so much space wasted and income lost. Where the plantation has grown beyond the reach of cattle, and they are allowed on it, it is necessary to protect the supplies from destruction by them. Fencing with dead sticks is expensive in that it has to be frequently renewed. The method I have found most successful is to have a hedge of the much-abused lantana round the plant planted in a circle a

couple of feet away from the hole. It is quick growing, and may be protected by thorns so as to keep cattle off it until a stout hedge is formed. It can be trimmed down to the height of the growing plant and during drought it has the advantage of affording shelter and conserving moisture, while the prunings enrich the soil. The cost of trimming the hedge once in six months is small. In a stiff soil the lateral roots thrown out by the lantana open up the soil. It grows on the surface and can usually be rooted up by hand, the roots loosening the soil. Finally, when the coconut plants are beyond the reach of cattle, the hedge is rooted up and buried in the plant-hole; or it is burnt after a week's exposure, and much potash, in which the, lantana is very rich, is added to the soil. The vigorous and perfectly developed plants, which flourish within this live hedge, falsify the theory that the lantana impoverishes the soil to the detriment of the plant. When saplings are planted in older plantations whose trees have taken possession of the land, it will be of advantage to cut a narrow drain outside the coconut-hole and say 5 feet away from the plant, all round it to a depth of 15 to 18 inches. This would help in checking the roots of the trees immediately round from interfering with the growth of the young plant.

The Red Beetle.

It is within this period that the red beetle is most active, and watchfulness is needed. The greatest care should be taken when weeding, that in the process of trimming, the branches are never torn off the stem. Cut off the dry branches with a sharp catty, allowing the butt end to remain on the trunk. The lace work of fibre, by which the dry fronds that encircle the tree are held together, offers the necessary obstacles to the intrusion of the beetle. If you safeguard this there will be small need to employ a staff of beetle-hunters who, I fear, greatly help the entrance of the beetle into the tree by needlessly meddling with, and disturbing, the branches thereby exposing the tender surface which offers an inviting entrance. There are estates where this pest is very active and it may be necessary in such to employ beetle-catchers; but they should have the strictest instructions and supervision. Beetle-catchers were regularly employed on a monthly salary on an estate when I took charge of it a few years ago. These men were promptly discontinued by me although it was with apprehension I looked at the strings of beetles hanging in the store verandah. I have no reason to regret my action. The *black* beetle is comparatively harmless in itself, but it often paves the way for the red. The fermented sap, exuding from the whole drilled by them, attracts the red offender.

The Black Beetle.

The black beeetle is more easily got at and should be regularly hunted. By their destruction there should be a corresponding diminution in the numbers of the red. One should not be in too great a hurry to cut down a tree attacked by the red beetle. If discovered in time, the tree, with careful treatment and periodical visits, can be saved. Where the damage is great, and the heart affected high up—a sure indication of which is the falling off of the tender spike—the only course is to chop up the tree, destroying all beetles and grub, and finally burning it. There should be no delay, as it would result in the escape of beetles to the subsequent loss of other palms. The fallen trees at Batticaloa led to a useful discussion regarding the life history of the

red beetle, from the larval stage. It was at first thought by the official advisers of the Government that the beetle took 18 months to little short of two years, if I mistake not, to develop. It was, however, proved by Mr. Francis Beven that the red beetle developed in a few weeks. Subsequent scientific investigation confirmed this view, and it is now accepted almost as a certainty that maturity can be reached in about eight weeks.

The Bleeding Disease.

So far, the coconut palm has flourished in Ceylon for centuries with no real danger threatening it. Great therefore was the consternation caused when, four or five years ago, there appeared on the scene the active fungus which caused what is popularly known as "The Bleeding disease" Fortunately, most proprietors were alive to the danger that would follow neglect. They set to work in adopting suggested remedies, and in experimenting with new remedies, with the happy result that the disease has been got under control.

In Conclusion.

The results of scientific research are now being applied practically to almost every field of human knowledge. Agriculture is now exalted to a science. The cultivation of coconuts has long been purely experimental. While we would welcome all that scientific methods can do to improve the cultivation of this great staple product of the Island, we must remember it is practical experience which can alone test and use intelligently the theories of scientists. All that I have written is based on experience. I gladly place it at the service of the Association for whatever it is worth; and hope it will elicit statements of the practical experience of others whose claim to be heard is greater than mine.

CUBAN TOBACCO.

Heinrich Hazzelling of the Bureau of Plant Industry, Washington, deals with this subject in a repriut from the Botanical Magazine.

The want of uniformity which is so striking in Cuban tobacco fields shows that no systematic effort has been made to improve the tobacco plant there, and is to be attributed to the special methods of agriculture in vogue.

The difficulty of raising seedlings in the plains owing to the fungus-infected condition of the soil makes it necessary to establish nurseries on new lands in the mountains. The resulting seedlings are packed in bales and despatched to their various destinations. The seed for raising these nurseries are not selected, but gathered indiscriminately from the suckers of the aftermath.

Experiments were begun in 1908 with a view to remedying the existing state of affairs by inducing pure-line cultures.

One of the commonest experiences in transferring plants from one region to an entirely different one is that the transfer is accompanied by great variation during the first year : but where pure-strains are selected, there is no tendency to breaking up of the type.

The tobacco plant is extremely susceptible to changes in environment, but such changes affected all the plants of a pure-strain alike, and do not cause a breaking up of the type.

CEARA RUBBER.

Dr. Ule, the discoverer of the new *Manihots*; *M. dichotoma*, *M. heptaphylla*, and *M. piauhyensis*, has recently visited Ceara, and from his experience there is inclined to regard *Manihot Glaziovii*, which furnishes the Manicoba rubber of Ceara, more favourably than hitherto. "As a result of my observations I have formed a rather more favourable opinion with regard to the suitability of *Manihot Glaziovii* as a plantation tree, and it does not appear to me at all advisable to replace this Manicoba by the species from Bahia and Piauhy, in the hill country of Ceara. *Manihot Glaziovii* undoubtedly tolerates a much damper climate than *Manihot dichotoma*, *M. heptaphylla*, and *M. piauhyensis*, which are true dry zone plants."

At the present time plantations of *Manihot Glaziovii* are to be found throughout all the hill region of Ceara, while the wild trees have been for the most part destroyed or reduced to small numbers. The plantations are established on old coffee lands. The hills, about 3,000 feet high, were formerly covered with heavy forest which was kept moist by the damp sea winds at the same time the forests acted as a barrier to the dry winds from the interior. Coffee at first yielded a handsome return but as more and more of the forest was cleared the district became subject to more dry winds with the result that the coffee died out. The few coffee plantations which now remain on the lower slopes are protected by Inga trees. *Manihot Glaziovii* was first put in as shade for coffee but is now planted independently. There are no very large plantations, but numerous small estates all over the hills; one of the largest plantations is that of the "Serinha Rubber Company," an English concern.

Tapping.

The tappers receive 800 to 1,300 Rees (75 cents to R. 1·12) for each Kilogramme (2·2 lbs.) of latex, but the pay varies according to the market price of rubber. The trees are tapped with a small axe, a "Machadinho," and the latex collected in tin cups. A tapper taps 100 to 200 trees a day, and obtains 2 to 10 kilogrammes or more of latex. Three kilogrammes of latex yield one kilogramme of dry rubber. The cost of tapping is therefore R. 1 to 1·50 per lb. The latex is coagulated in flat metal dishes by means of formalin, and the wet rubber is passed three times through rollers, being washed the second and third time with hot water. The sheets take one to four weeks to dry. Tapping is carried on for three months only, from July to October.

In another method of tapping the bark is cut off for a length of 20 to 30 cem. and the latex allowed to flow down the stem. This is continued for a period of 20 days, after which the coagulated rubber is stripped off.

As Ule states, the labour entailed by this method is small, but the tree soon dies. The rotating pricker has been tried, but is said to have been abandoned because it causes decay beneath the bark; whether this is an actual experience or an echo of a recent Ceylon controversy is not clear, but apparently it is the latter.

In the Botanic Garden at Para, *Manihot dichotoma* and *piauhyensis* make poor growth, but *M. Glaziovii* grows well. *M. piauhyensis* and

heptaphylla are said to yield more rubber than *Manihot Glaziovii*, and to the south of Piauhy where no wild Manicobas occur, *piauhyensis* is planted in preference to *Glaziovii. M. dichotoma* is said to be tapped by a spiral cut, but the method is deprecated and it is prophesied that the adoption of other systems will give better results. (*Tropenpflanzer*, February 1912.)

T. P.

DR. STRANGE'S SYNTHETIC RUBBER.

The India Rubber Journal frankly confesses itself disappointed with the synthetic product of Dr. Strange which is said to resemble a sticky third rate African paste, with an awkward appearance of chewing gum, rather than good Hevea rubber.

The claims made by the promoters of this product are shortly summarised as follows:—

1. Potatoes yield starch
2. Starch on fermentation yields fusel-oil
3. Fusel oil on treatment yields isoprene or a homologue of it.
4. Isoprene or its homologue on treatment in contact with sodium is converted into caoutchouc.

The figures given by Dr. Strange as representing the percentage of the different products in the above transformations are questioned, particularly that of caoutchouc from fusel oil which Dr. Strange gives as 98, but the *I. R. Journal* puts at 5. A calculation is made to show that one million acres of potatoes would be required to produce 10,000 tons of caoutchouc. "Apparently the British farmer has a good time before him!"

COTTON-GROWING IN JAMAICA.

The Secretary submitted statements of the results of the various experimental plots of cotton grown in Trelawny, St. Ann and St. Elizabeth. Also the results of shipping the cotton produced and other lots purchased at 3*d.* per lb. from small growers in St. Elizabeth, ginned by Mr. Conrad Watson, and marketed along with his own, but marked separately. The cotton fetched 1*s.* 3*d* per lb. in London, and freight, being now per ton measurement, worked out at 1*d.* per lb.; still the result showed a net return of ½*d.* per lb. on the seed cotton purchased at 3*d.* Later, through Mr. Watson's representation, the Royal Mail Company reduced the freight from 47*s* 6*d.* to 17*s.* 6*d.* per ton measurement, and gave a refund, making the net return 1½*d.* per lb.

It was resolved to discontinue any further effort to encourage cotton-growing in the dry sections at St. Ann and Trelawny, as people had not responded in these districts, but to concentrate effort on St. Elizabeth, Portland-Vere, where fair crops had been got in spite of a series of very dry seasons, and where the people were taking well to this crop. From the money at credit to cotton account it was decided to offer prizes of £2 and £1 on the best grown cultivations of cotton of not less than half an acre in the districts of St. Elizabeth and Portland-Vere. (*Journal of the Jamaica Agricultural Society*, March 1912.)

A NEW DISEASE OF THE CEARA RUBBER TREE.

A new serious disease of the Ceara rubber tree (*Manihot Glaziovii*) is recorded in the *Tropenpflanzer* for February, 1912, by Dr. Ule, who has recently visited Ceara in order to investigate the conditions of rubber production in that country. It is characterised by the production of large swellings on the twigs and branches, often more than four times the diameter of the branch attacked. Most of the swellings give rise to a number of young shoots which in some cases form "Witches Brooms.' The cause of these deformations is a rust fungus, *Uredo Manihotis* P. Henn., which was originally discovered on wild Manihots in Brazil in 1892. It occurs on the leaves as well as on the stems, but in the former situation it forms only the customary rust spots. Swellings are formed when it attacks the stem because, according to Ule, the mycelium of the fungus stops the flow of sap. No other stage of the fungus has yet been discovered, and it is therefore not known whether it requires an intermediate host plant to complete its development. The disease is widespread throughout the whole Serra de Baturite, in the plantations along the railway, and in the Serra de Maranguape; and Ule considers it probable that it occurs throughout the whole of Ceara and Rio Grande Do Norte. When trees are attacked by the disease, the flow of latex diminishes, the diseased branches die off, and finally the tree succumbs. Ule considers that there is little danger of spreading the disease by the distribution of seed, but cuttings should be taken only from sound trees. This opinion is quite contrary to the generally accepted view that *Hemileia vastatrix*, a similar fungus, was spread from Ceylon with coffee seed, either on the seed or in the packing material, to other countries in the East; and it would appear advisable that countries importing seeds from Ceara should insist on disinfection.

The fungus is known to occur on Manioc, *Manihot utilissima*, as well as on *Manihot Glaziovii*.

T. P.

ESTIMATE OF THE AREA UNDER COTTON IN AUGUST.

Provinces and States.	1012-1913.	1911-12	1910-11.
Bombay (Deccan) (*a*)	1,357,000	1,467,000	1.545,000
Central Provinces and Berar	4.222,000	4,135,000	4,491,000
Madras	60,000	136,000	136,000
Punjab (*a*)	1,228,000	1,322,000	1,285,000
United Provinces	(*b*)	(*b*)	(*b*)
Burma	192,000	179,000	168,000
Bengal	50,000	63,000	161,000 (Bengal, Bihar and Orissa, Assam)
Bihar and Orissa	80,000	85,000	
Assam	35,000	36,000	
N.W. Frontier	48,000	45,000	31,000
Ajmer-Merwara	14,000	18,000	24,000
Hyderabad	2,213,000	2,509,000	2,833,000
Central India	(*c*) 675,000	(*c*) 747,000	1,285,000
Rajputana	(*d*) 236,000	(*d*) 230 000	384,000
Mysore	11,000	6,000	12,000
TOTAL	10.421,000	10,978,000	12.355.000

(*a*) Including Native States. (*b*) Figures not reported. (*c*) Excluding Gwalior and Baghelkhand States (Report just received for Baghelkhand shows 28,000 acres sown.)
(*d*) Excluding Mewar and Bundi States.

TROPICAL PLANT FIBRES.

In July, 1911, an International Congress and Exhibition dealing solely with fibres and fibre plants was held at Soerabaya (Java), attended chiefly by representatives from the Dutch Colonies and the Philippines, The Exhibition included living specimens of fibre plants, samples of prepared fibre and manufactured articles, and a large machinery section, while the Congress endeavoured to arrive at some conclusions as to the value of the various fibre plants from the cultivator's point of view, chiefly however with regard to the Dutch Colonies. The following notes are taken from a report by Dr. W. E. Bruck in the *Tropenpflanezr* for February, 1912.

The production of fibres in the Dutch East Indies is as yet comparatively small. The total area under fibre plants at the beginning of 1911 is given as follows:—

Kapok	72,500 acres
Sisal and other Agaves	16,000 ,,
Manila hemp, etc	4,600 ,,
Cotton	22,000 ,,

Sisal Hemp.

This is the most important fibre plant in Java. But the species of Agave cultivated there is chiefly *Agave cantala* Roxb., which is quite different from the white Sisal or Henequen of Mexico. *Agave cantala* has hitherto only been cultivated in the Philippines (Manila Maguey). *Agave sisalana* has also been cultivated in Java but the culture is diminishing. The Congress came to the following conclusions:—

The culture of Sisal hemp is not remunerative on lands which do not permit cheap transport of the raw material, nor on poor land nor in a cool region where the yield falls below 650 lbs. of fibre per acre. It can be grown with advantage on soil deficient in humus, where cacao and coffee no longer flourish. The soil must be free and situated not more than 1,200 feet above sea level. It is most profitably grown as a secondary product since it can then be left untouched when the market price is low or during seasons when the production of leaf is small. It cannot be recommended as a catchcrop or intercrop. If sisal is the chief product, estates of less than 700 acres are not profitable. For an estate of 900 acres the cost of upkeep and replanting, upkeep of buildings, management, etc., together with 5 per cent. interest on the capital, will be about 54 rupees per acre. The capital required is estimated at 335,000 rupees. The expenses of harvesting, transport, commission, etc., and depreciation are reckoned at about 100 rupees per ton of fibre, while the value per ton of dry fibre f.o.b. Java is about 300 rupees. The net profit, with a production of 650 pounds per acre is not more than 5 per cent, but with a production of 1,300 lbs. per acre it increases to 20 per cent.

Hibiscus Fibre.

Java jute is produced by a species of Hibiscus, said to be identical with *Hibiscus cannabinus*, from which Madras jute and Gambo hemp are obtained, but there appears to be some doubt whether this identi-

fication is correct. The Congress was of opinion that the cultivation of this species was too limited, and the available figures too contradictory, to admit of valid conclusions as to its value.

Manila Hemp.

Experiments made in Java with Manila hemp (Abaca) have in some cases given very good results, though the fibre is not of such fine quality as the better sorts of *Musa texilis* from the Philippines. The cultivation is not profitable except where cheap transport and cheap hand labour is available, nor where the production falls below 850 lbs. of dry fibre per acre. In Java, Abaca requires a loose soil, rich in humus, not more than 1,600 feet above sea level. Under favourable conditions the production may reach 1½ tons of dry fibre per acre. Interplanting with Manila hemp is not to be recommended. If Manila hemp is the chief product an estate of less than 450 acres is not remunerative, but as a secondary product, 90 acres will pay. For an estate of 900 acres with a capital of 335,000 rupees, the cost of upkeep will be about 54 rupees per acre, and the cost of harvesting and putting on the market in Europe 125 rupees. Taking the value of Manila hemp in Holland at 380 rupees per ton, this would yield a profit of 5 per cent. with the minimum yield of 850 lbs. per acre, which would be increased to 20 per cent. with a yield of 1,700 lbs. per acre.

Pineapple Fibre.

Favourable results have been obtained with this fibre in the Philippines. The demand for it is irregular and there is no fixed market for it, but it possesses good characters which make it of value for special purposes. Experimental results, however, are not yet available. The Congress considered it suitable for native cultivation. The following figures, relating to the manufacture of fibre on a small scale, were furnished. Pineapple leaves, bought from the natives in Sumatra, cost 20 cents per 100 kilogrammes and yield 20 per cent. of dry fibre. The value of this in Europe is 30 to 35 cents.

Kapok.

Java produces more Kapok than any other country, but true Kapok (from *Eriodendron anfractuosum*) is largely adulterated with that from *Bombax*. There are few plantations, the trees being chiefly planted by the natives, or along estate roads as a secondary product. The largest plantation produces 500,000 to 650,000 lbs. of Kapok per annum. Specimens of fabric woven entirely from Kapok were exhibited, but as the price of Kapok is higher than that of cotton these were rather of the nature of a curiosity than a commercial possibility. The Congress was of opinion that Kapok was a profitable side-product for the native cultivator, but though it could be made to pay as the sole product of an estate, the return per acre was generally small. The cultivation of Kapok was recommended on coffee and cacao estates. The demand for this fibre steadily increases, and there is no danger of over-production.

Ramie.

Experiments with Ramie have been made in the Dutch Colonies, especially Sumatra, and excellent fibre has been produced; but the cultivation has proved too costly and the results have never shown a profit.

Coir.

The report on this product illustrates the limitations of the Congress. The manufacture of coir on a large scale for export has not yet been

undertaken in Java, and consequently no details or figures were available for discussion. The expert from the Philippines is recorded to have stated that there was to a certain extent antagonism between a copra and a coir industry, since for the former ripe nuts only could be used, while for the latter the nuts must be unripe. While the statement is no doubt broadly correct, one would scarcely venture to assert that it is observed in practice; in Ceylon, the manufacture of copra cannot be said to "exclude" the manufacture of coir.

Cotton.

The last day of the Congress was devoted to a discussion of the question whether an extension of the existing cotton cultivation of the Dutch East Indies would pay. Up to the present, cotton has been grown only as a native product in Palembang in Sumatra and Demak in North East Java. The Government have appointed a special cotton expert to carry out experiments and instruct the native cultivator, and are endeavouring in this way, and by the distribution of seed, to improve the cultivation. Very little European capital is available for this product.

T. P.

THE DIRECTOR OF ROTHAMSTED.

The resignation of Dr. Hall is announced, and his successor is Dr. E. J. Russell who has been associated with Rothamsted for some time, and carried out investigations into soil fertility resulting in discoveries which the *Gardeners' Chronicle* thinks are destined to become classic. Fertility is now admitted to be dependent on complex biological factors, the action of which is only now beginning to be comprehended.

THE SAGO PALM.

The neighbouring colony of British North Borneo exports some p120,000 worth of Sago annually.

The Agusan Valley of Mindanao could undoubtedly export several times this amount from the vast swamps filled with the same species of sago palm which extend across the Sulu Archipelago into Borneo, and eastward to New Guinea. There is no doubt that some day these swamps will be the scene of great activity in the way of starch, sugar, and alcohol manufacture.

Sago flour, when properly prepared, is an excellent food and by fermenting alcohol can, of course, be made. Fortunately, the sago palm produces itself from suckers as soon as the old plant is felled; but unfortunately perhaps for the palm-sugar maker, it is a palm which dies at the time of flowering, like the cabo negro and buri.

Properly managed, a sago swamp would be continuously productive without replanting or cultivation of any kind; that is, the growing palms should be allowed to stand at proper distances and all unnecessary suckers and useless intermediate trunks should be removed, allowing one or two suckers to grow from the base of each trunk as soon as it is ready for cutting. In fact, the sago may some day rival the nipa as a profitable palm crop, though it will never compare with the coconut. —*Philippine Agricultural Review.*

COST OF RUBBER PRODUCTION IN MALAYA.

The majority of investors in rubber plantation companies have long since realised that the most rapid growth and the largest yields are to be associated with estates in the Malay Peninsula; in fact, it would be no exaggeration to say that an average yield of 250 lbs. per acre per annum can be expected from six-year-old trees in Malaya, as against one of 150 lbs. per acre in Ceylon. These satisfactory results were not known to the pioneers, but it is a peculiar coincidence that the Malay Peninsula appears to have been selected by Government authorities as an area which would stand a somewhat heavy rate of taxation. It has been suggested by many leaders of the plantation industry that the reason why costs of production are so much higher in Malaya than elsewhere is that the taxes in the form of rent payable to the Government each year, drainage assessments, and the *ad valorem* duty of 2½ per cent. are excessively high, and represent several pence per lb. on the cost of rubber. Some little correspondence has been published in the press with regard to this, Government officials maintaining that it is by no means criminal to tax a successful industry, and to use the revenue derived by such means for the development of poorer states.

Management and Labour.

While we admit that all this taxation has quite a marked effect on the cost of production, we cannot agree with the suggestion sometimes thrown out that taxation in Malaya is the main offender. In the first place, we know only to our regret that the costs of coolie labour in Malaya are far in excess of those in Ceylon; in point of fact the dollar in Malaya appears to be only equal to the rupee of Ceylon in its purchasing capacity. Again, we know that a salary of £500 or £700 in Malaya for young managers is very frequent, whereas in Ceylon such a salary would be considered quite good, and would only be given to men with considerable experience. Ceylon will always on account of these difficulties be able to stand the strain of smaller annual returns. Coolie costs, costs of European management, and even also of London management, are far greater to-day in connection with rubber than they have ever been with tea companies in other countries. We therefore think that these features must in fairness be allowed for when criticism is being offered on the subject of taxation by Government, and its effect on the cost of producing rubber.

Cost of Production.

During the last few weeks the accounts of several important and highly-reputable rubber companies have been published, and we cannot but admit that the actual cost of producing rubber on these properties has been far higher than we or anyone else anticipated. Take for instance the Straits Rubber Co., Ltd. The cost of production, free on board at Penang, including commission to the staff and depreciation, was 1*s*. 7·83*d*. per lb; adding to this London expenses, freight, insurance, landing and sale charges, the total cost amounts to just over 2*s*. per lb. Now such a cost would perhaps not have occasioned surprise if it had been associated with an estate just coming into bearing, or with a very small crop. As a matter of fact, the crop harvested for 1911 at a cost of 2*s*. per lb., was no less than 985,279 lbs. The areas being tapped were planted

from 1904 to 1907, and were therefore comparatively young; as this acreage amounted to nearly 4,000 acres, a cost of 2*s.* per lb. can only be regarded as excessive. It is true that in the case of this estate a very highly efficient staff is maintained in the East, and we should be sorry to hear of any reduction in salaries or officers in connection with that part of the Company. It is, however, to be hoped that with a crop of 1,400,000 lbs., as estimated for the present year, a considerable reduction in cost of production will be achieved. If such a crop cannot be harvested at much less than 2*s.* per lb., we are afraid that many smaller concerns will soon feel the pinch.—*India Rubber Journal.*

ST. VINCENT BOTANIC STATION REPORT FOR 1910-1911.

It does not appear that *Manihot dichotoma* and *M. piauhyensis* will be successful under the conditions of trial. The trees of *Hevea brasiliensis* have flowered for several years in succession, but have not produced any seed. *Castilloa elastica* has shown great susceptibility to attacks by scale insects and mealy-bug, and the plants have been removed and replaced by *Hevea brasiliensis.* It is not considered desirable under present conditions to recommend any extensive planting of Castilloa in St. Vincent. Other interesting plants which receive attention include the mangosteen, a species of Tecoma, pimento, and *Michelia Champaca,* the last of which produces in profusion delightfully fragrant flowers; it is the champak of Shelley's *Indian Serenade* :—

'The champak odours fail,
Like sweet thoughts in a dream.'

The large attention that is given by planters to the cotton and arrowroot industries prevents the distribution of plants from the station from being either large or varied, the number of economic plants sent out during the period under review being 4,340; of these 4,003 were cacao, and the next largest distribution—126—rubber; there were also miscellaneous plants, as well as a certain amount of produce and seeds that were sold.

The particulars given concerning the rainfall show that the amount recorded at the Botanic Station during 1910 was 104·03 inches, which is 1·25 inches below the average of the past seventeen years. Particulars of the rainfall for the past twelve years indicate that the driest months are February, March and April, and the wettest June and October, each of the last having an average precipitation exceeding 10 inches. . . . . .

Cotton.

The notes on agricultural industries are concerned mainly with cotton and it is shown that the export of Sea Island and Marie Galante line, during the period under review, was 540,339 lb., valued at £41,836 as compared with 394,667 lb. valued at £26,775, in 1909-10. Since 1903-4 the total exports from St. Vincent of these two kinds of cotton have, to the date given, amounted to 2,392,884 lb. having an estimated value of £160,407. During the past three years, there has been a steady increase in the yield of lint per acre, the amount stated being a return of 156 lb. In this section of the report are contained interesting details concerning legislation in regard to the cotton industry, labour-supply for cotton-growing, peasant cotton-growing, selection for improvement, and pests and diseases, *Agricultural News.*

CEYLON AGRICULTURAL SOCIETY.

PROGRESS REPORT LX.

Membership.

Since the last meeting of the Board held on May 9, 1912, the following have joined the Society as members:—The Hon. Mr. Anton Bertram; A. E. Byrde; A. T. C. Meyer; D. L. Jayatilleke; H. W. Boyagoda, Ratemahatmaya; C. S. Braine; William R. Webster; J. F. Templer; T. Del; T. B. Worthington; E. C. Shelton Storer; F. T. Coore; Graham L. Smith; B. O. Dias; B. W. Bawa; Eastern and Pacific Trading Co.; B. Stuart; P. G. Wood; C. D. Waddilove; F. Halliley; L. B. Green; C. L. de Zylva; R. J. McMullin; the Superintendent, Para estate; O. B. M. Cheyne; N. Ratnasabapathy; Martin M. Smith.

Staff, Inspection Work, &c.,

Mr. R. N. Lyne, F.L.S., the Director of Agriculture, arrived in the Island on May 20, and gave an address at the Annual General Meeting of the Society on July 3. Mr. Lyne has been appointed Organizing Vice-President of the Society and Editor of the Society's magazine.

The Director and Secretary made a circuit through the North-Western, North-Central, and Northern Provinces between July 20 and 27, two days of which were spent in inspection work in the Jaffna peninsula. A visit was also paid to the scene of operation in connection with the Karachchi scheme at Iranamadu. Subsequently Madipola, Weuda, Kurunegala, and Nikaweratiya were visited.

The services of the Chief Clerk (Mr. J S. de Silva) were lent to the Honorary Secretary of the All-Ceylon Exhibition from June 12 till July 15. Mr. Silva, who was placed in charge of a large staff of clerks, received the following acknowledgment of his services from the Secretary :—

"I am directed by the President of the All-Ceylon Exhibition to convey to you his appreciation of the very valuable services rendered by you to the Honorary Secretaries of the Exhibition, and am to forward for your acceptance a gold medal as a souvenir of the occasion and in recognition of your efficient execution of the duties entrusted to you."

The whole office staff and all the Agricultural Instructors were engaged at the Exhibition between June 25 and July 10. Of the latter, Messrs. N. Wickremaratne and W. Molegode were awarded silver medals for their services.

Mr. S. Chelliah, Agricultural Instructor, Northern Province, visited Andankulam, Kantalai, and Periyakulam major tanks in the vicinity of Trincomalee, and reports that fruit plants, including orange, lime, soursop, have been planted by Mr. Emerson's direction in the premises attached to the residences of the tank guardians, but these have suffered for the want of proper tillage and mulching, which they are now receiving. The Director of Irrigation approves of the extension of cultivation of fruits on lands irrigable by tanks, and Mr. Emerson is interesting himself in the project. Since his return from Batticaloa, Mr. Chelliah has been devoting

his time to the Jaffna District, and was largely instrumental in arranging for a representative provincial exhibit at the All-Ceylon Exhibition from the Northern Province.

Mr. L. A. D. Silva continues to work in the Ratnapura District, where he is confining himself to the programme mapped out for him at the beginning of the year. He is introducing cinnamon, pepper and cotton into suitable districts.

Mr. N. Wickremaratne, Agricultural Instructor, Southern Province, visited Ambalangoda, Nagoda, Akmimana, Gonapinuwela, Baddegama, Hikkaduwa, and toured in Hambantota District.

Mr. W. Molegode, Agricultural Instructor, Central Province, went on short leave after the Exhibition, nominating Mr. Jas R. Nugawela as his substitute to complete his itinerary work. Since August 1st he resumed active service and visited Madipola, Teldeniya, Harispattu division, Matale, and Ukuwela, and also paid a visit to the Kegalla District to make a special report on the complaints about the silting up of paddy lands as the result of wash from rubber clearings.

Mr. P. B. M. Bandaranayake was sent to Kandy to assist Mr. Molegode. He visited Teldeniya, Madugoda, and the Kalalgamuwa Experimental Garden.

Mr. A. Madanayake, Agricultural Instructor, North-Western Province, visited Balalla, Gokerella, Batalagoda, Ibbagamuwa, Nikaweratiya, Hettipola, Nakkawatta, &c. He is supervising the garden work at Balalla, Hettipola, and Nikaweratiya.

Mr. M. J. A. Karunanayake was attached to the seed store in Colombo, paying weekly supervision visits to the Bandaragama Experimental Garden.

Mr. C. K. Sathasivam was engaged in the Experimental Garden at Tampiluvil and visited Nintavur, Sammanturai, Udanka, Veeramunai, Sorikkalamunai &c. He has succeeded in interesting the cultivators of the South in cotton cultivation.

Mr. N. M. Jayasuriya, Agricultural Instructor, Kegalla District, visited Undugoda, Panawaka, Mawanella, and Siyambalawa.

Shows.

The All-Ceylon Exhibition held from July 1 to 6 was voted on all hands a thorough success. The work in connection with it was done at various times by Mr. H. F. Macmillan (Curator, Royal Botanic Gardens), Mr. C. Drieberg (Secretary, Ceylon Agricultural Society), Mr. A. N. Galbraith, C.C.S., and last but not least, Mr. E. B. Denham, C.C.S., who did much to expand the scope of the Show so that its magnitude came as a surprise to those who did not see it grow.

A full official report of the great Show will, no doubt, be available shortly.

A market show will be held in December next at Hakkaduwa under the auspices of the Wellaboda pattu (Galle) Agricultural Society.

Agricultural Instructor Wickremaratne reports as follows on the Kalutara Market Show held on May 11th last:—

"This was the third show held in the Kalutara totamune, and the first of the three shows held in the district for the year. The show was organized by the Totamune Mudaliyar, Mr. J. V. G. Jayawardene. The

awards, consisting of silver medals and money prizes, and a silver shield for the best school garden in the division, were given away by Mr. Plant, the Assistant Go ernment Agent, in the presence of the Secretary, Ceylon Agricultural Society, and a large number of visitors. At this show, as at other village shows in the district, money prizes were distributed among villagers (both men and women) for keeping their home gardens neat and clean. At the close of the show the Assistant Government Agent announced that in future he would have two different sections, one for villagers only and the other for headmen, so that the former will not have to compete with the latter. There were ten classes of exhibits, and there was general improvement on the previous shows.

"Among *fruits*, pines (Kew and Mauritius), mangoes, oranges, pomelo, papaws, limes, namnams, jambu and kaju were well represented, as well as jaks of remarkably large size. Plantain and mangosteen were conspicuous by their absence. Under *yams*, sweet potatoes attracted much attention for their wonderful growth; cassava, innala, arrowroot and gahala were good. The *vegetable* class was not very satisfactory as a whole but the exhibits of capsicums, bandakkas, brinjals kohila and tomatoes were good. *Dairy produce* was poor; eggs were well represented. The *commercial products* made up the best class in the show. Products of the coconut palm, including 29 fine samples of oil, were shown, and nutmeg, pepper, betel, jaggery, ginger, vinegar, paddy and rice were well represented.

"All sections of *Live Stock* were represented, but the compettion was poor. *Lace* and *needlework* made a strikingly good class. A fancy curtain made of the kekilla fern (*Gleichenia linearis*) by Mr. L. Jas. Pereia of Wadduwa was much admired. *Industrial Exhibits.*– Kalutara baskets, betel bags, carved coconut shell work, fancy furniture and mats were well represented. There were several exhibits of *pickles* and *jams*.

"Mahanama Buddhist School won the silver shield for the second time for the best all-round garden in the division. Tantirimulla came second."

The following is the report of Agricultural Instructor Karunanayake on the Bellanā Show held in May last:–

"The annual market show for Pasdun Korale East and West organized by Mudaliyar Samarasinghe was held at Bellana on May 18, under the patronage of the Assistant Government Agent, Kalutara. In spite of the inclement state of the weather there was a good gathering of visitors.

"*Fruits* constituted the best class in the show. Fine specimens of pineapple, oranges, mandarins, jak, limes, papaw were exhibited. Sapodilla and plantains were rather poor. *Yams*, including sweet potatoes, arrowroot, cassava and gahala made a good show. The *vegetables* were rather poor, there being no exhibits of snake gourd, bitter gourd, pumpkin, tomato, chiefly owing to the heavy rains that preceded the show. Capsicum, chillie and brinjal were well represented. Plantains were rather poor. *Dairy produce*, consisting of milk, ghee and curd, were good, but the eggs were disappointing. Among *commercial products* some good specimens of coconuts, copra and oil were exhibited. Plumbago, cotton and honey were also shown. *Live stock*, specially fowls, were better than last year. The *needlework* section was well represented, and included excellent samples of lace and embroidery. The *industrial*

products were very poor, excepting one or two good specimens of mats. *Preserves* and *pickles* were fairly good. Under *School Garden Products* there were six entries, and the first prize was awarded to Bellana School, which showed a very good collection of vegetables as well as fruits. Tudugala was scond best."

The same Instructor reported as follows on the Bandaragama Show, also held in May last :—

"The annual market show of Rayigam korale, organized by Mudaliyar Wirasinghe, was held at the Wevita Government School on the 25th instant, and was opened by Mr. G. F. Plant, Assistant Government Agent of Kalutara, in the presence of a large gathering of visitors, including the Secretary of the Ceylon Agricultural Society. Among the *fruits* were fine specimens of mangoes, pineapples, oranges, pumelo, lime, jak, soursop, and papaw. Plantains were on the whole rather poor. A feature in this class was the exhibit of pines, which in number and quality were better than those hitherto shown. Yams, cassava, sweet potatoes, arrowroot, kukulala and innala made a good show. The *vegetable* section was also a good one. Practically all the kinds specified in the catalogue were represented, and among these were very fine specimens of capsicum, kohila, bandakka brinjal and chillie. *Dairy produce* was rather poorly represented with the exception of eggs, which made a fairly good show. Among the *commercial products* were some very good specimens of coconuts, oils and plumbago. The exhibits in the *live stock* class were very satisfactory, particularly the fowls. The *needlework* exhibits were fairly good. Under *industrial products* the specimens of mats were very fine; and ekel brooms, coconut shell work, and Kalutara baskets also made a good show. *Preserves* and *pickles* were rather poor. For *School Garden Products* Paragastota was awarded first prize."

A village show was held at Akmimana, near Galle, on June 22 (as a "feeder" for the Colombo Exhibition), at which the Secretary was present.

Paddy.

A variety of paddy from India known as Molagu Samba, and recommended as superior to Mutusamba, is under trial on a fairly large scale by private cultivators at Ambalangoda, Matale and Batticaloa, and on a smaller scale by the Agricultural Instructors.

The following information regardidg this variety has been supplied by the Indian authorities :—"Molagu Samba paddy is transplanted here in August—September. The seedlings are raised thinly at the rate of 8 Madras measures for 8 cents of seed bed, which is heavily manured. The seedlings raised in 8 cents of land will be quite sufficient to transplant an acre. The seedlings are pulled out when they are 30 to 40 days old and transplanted singly 4 to 6 inches apart. After transplanting, the land is always kept under water—say about an inch deep—so that the puddle is never allowed to dry. Under these conditions Molagu Samba does well on ordinary wet lands, taking about 5 months to mature. This is a very good tillering variety. The stems of plants are stout enough to bear heavy heads without lodging. The variety is easily thrashed."

Good reports continue to be received regarding Rascadum paddy, referred to in the last Progress Report. Writing from Katugastota Mr. J. R. Nugawela reports that he considers it the best for Harispattu.

Cotton.

It would appear after a great many trials conducted in various parts of the Island with different varieties of cotton seed, that the American long staples are the most likely to suit our conditions, and on the recommendation of the local agents of the British Cotton Growing Association (Messers Freudenberg & Co.), based upon their experience at their ginnery, the variety known as Allen's long staple, which is reported to have given the best results all round, will be selected for future growings. This is a point gained, as it is important that we should grow only one variety of cotton so that our produce should be of one quality and characteristic of the Island.

Mr. W. Sabapathy, who made a trial of cotton and soy beans in Kayts Island last year, has been afforded facilities by Government for cultivating some 40 acres next season. The experiment is an important one for the Jaffna District.

So far Matale North has been the scene of the most extensive cotton operations, and the results have been extremely encouraging.

The following report (43,828 of May 7) was received from the Imperial Institute on a sample of Black Rattler seed cotton grown in Tumpane, Central Province :—" Line clean, fairly lustrous, soft, fine, cream-coloured and free from stains. Yield of lint on ginning apparently 30·6 per cent., yield per 100 seeds 4·3 grams. Strength fair, length of fibre from ·9 to 1·6 inch—mostly from 1·1 to 1·4. Commercial value 8½*d*. per lb. ginned, with 'middling' American at 6·57*d* .per lb. and 'good' Abassi at 11*d* per lb. The cotton is of good, useful quality and would be readily saleable in the United Kingdom."

The British Cotton Growing Assocation expert, reporting on the same sample, wrote :—" American character, rather dull, fairly clean, staple about 1¼, not very strong, but fine. Value 8·25*d*." The Secretary of the Association referring to the cotton says: "This is a very good result indeed."

Cotton has done very well at Balalla, North-Western Province, and the Government Agent has proposed, with the assistance of the Society, to start two rotation gardens, with cotton as the main crop, at Hettipola and Nikaweratiya. These are about to be inspected by the Director of Agriculture and the Secretary, Ceylon Agricultural Society, and arrangements will be made to get the land ready for October planting.

At Madipola garden (Matale District) the growth of cotton by the teacher is encouraging. Still another place where a series of carefully conducted cotton trials have been carried on (by the teacher of Mediwaka school) is Kalalgamuwa. Full reports will be available shortly.

Kekuna (*Aleurites triloba.*)

An inquiry was received some time back from a German firm about these nuts which are locally used as a source of oil in the Kandyan Provinces and in response to a circular letter a good deal of information was gathered as to probable supplies that would be available. From letters received it was gathered that the use of the oil for burning was being given up for kerosine oil and that large supplies of the nuts would be available but for the fact that the timber of the tree was being utilized for making tea-boxes. The oil-kekuna tree (which must not be confused with *Canarium zeylanicum*, also called kekuna) is a fast grower and occurs in the

wild state, bearing fruit (according to Mahawalatenne Ratemabatmaya) in about three years. As the result of experiments made in the Technical College at Hanover a trial order was received last year for one ton of shelled nuts at Rs. 12·50 per cwt. delivered in Colombo.

Recently a correspondent from the Philippines drew attention to the fact that the tree is very common in the Philippine Archipelago and that a demand had sprung up for the oil for varnish and other purposes, the price paid for the kernels being £1-2 per picul of 133 lb., "which," says our correspondent, "puts them almost in the same class as copra." The shipment of the nuts from one Province alone last year is said to have exceeded £2,000 in value. This suggests the possibility of a local industry in a valuable oil and manurial cake by saving the tree from the timber trader and exploiting it in the wild state, and even by planting up new areas.

Investigations and Reports.

The Director of the Imperial Institute writes under the date July 22 last: "With further reference to your despatch No. 713, Miscellaneous, of November 29, 1911, and to my letter No. 6511 1912 of February 16th last, I have the honour to inform you that the consignment of mee (*Bassia longifolia*) kernels referred to therein was duly received at the Imperial Institute from the Secretary of the Ceylon Agricultural Society, who inquired in letter No. 796 of March 26, 1912, whether about 3 tons of the kernels per season would be saleable in the United Kingdom at £12 or £13 per ton.

"I have been in communication on this subject with (*a*) the firm referred to in my letter No. 3,1671 1911 of August 25, 1911, who are importers and crushers of oilseeds, and (*b*) an important firm of soap manufacturers.

"(a) The oilseed crushers, after examining a sample from the consignment, reported that the solid fat yielded by the kernels would be very useful for the manufacture of hard soap. They valued the kernels at £12. 5*s.* to £12. 10*s.* per ton (May, 1912), delivered in bags *ex* ship Hull. With reference, however, to the question as to whether three tons of mee kernels would be saleable in the United Kingdom, they pointed out that they would not be able to take up this product unless they could be certain of receving at least 500 to 1,000 tons per season. If the price were suitable they could purchase even larger quantities.

"In reponse to a suggestion that the three tons of mee kernels might be mixed for crushing with mowra kernels from elsewhere, until large supplies were available from Ceylon, the firm stated that they were not working mowra kernels at present, as they were unable to obtain them at a reasonable price.

"(*b*) The soapmakers reported that the mee kernels were comparable with mowra seed, the present market price of which was from £12 to £13 per ton, but they also were unwilling to buy so small a quantity as three tons.

"Consignments of only a few tons of mee kernal would be difficult to sell, and in any case could not be expected to realize their full value. A remunerative export trade will probably not be possible until consignments of at least 100 tons can be shipped from Ceylon, but when this can be done the kernels, if in good condition, will sell readily at prices comparing favourably with the market price of mowra kernels."

Mr. E. B. Nathanielsz, presently of 1,121, Bedford Avenue, Brooklyn, reporting on April 1st on a sample of coca leaves forwarded by Mr. K. Bandara Beddewella of Maligatenna, Kandy, says: "The coca leaves have been valued at 13—16 cents (American)=39—48 Ceylon cents per lb., duty amounts to 5 cents per lb. How does this compare with London and Hamburg? Bolivia leaf still holds its own. Just now the market is dull, as large stocks are held in Hamburg. As for cajunuts we can give from 16 cents (48 Ceylon cents) upwards."

The Government Agricultural Chemist has furnished (June 25, 1912) the following report on rain tree (*Pithecolobium saman*) beans, submitted to him for analysis by the Secretary, with an inquiry whether they are likely to prove useful as food for cattle (which readily eat them), like the locust bean (*Ceratonia siligua*) of Cyprus, and the Algaroba bean (*Prosopis juliflora*) of the Hawaii Islands :—"I beg to enclose my analysis of above, and regret that I cannot give definite answer as to whether this would be suitable as a base for a feeding stuff, as there was not a sufficient quantity of the sample to make extracts for determination of the toxicological effects on animals. It will be seen from the analysis that the seeds have about the same percentage of proteid matter as wheat pollard, but the latter has more Carbohydrates and oil, and less fibre. The nutrient ratio works out at 1·4, against wheat pollard 1·5.

"The following is the analysis :—Moisture, 18·40 per cent.; ether extract, 1·50 per cent.; proteids 12·90 per cent.; woody fibre, 16·70 per cent.; carbo-hydrates, 48·40 per cent.; ash 2·10 per cent.; total, 100·00 per cent. Nitrogen, 2·06 per cent.; nutritive ratio, 1·4 per cent,"

A correspondent from Ipoh, Straits Settlements, in forwarding a sample of earthy nodules, writes that it is imported by the Chinese for their pot plants, which thrive very luxuriantly as the result of being grown in soil mixed with this manurial earth. The sample was submitted to the Government Agricultural Chemist who reports as follows :—

"The sample when received was in lumps and had all the appearance of a clay. On grinding it was found to consist of fine earthy matter, 98 per cent. passing the 60 mesh sieve. On analysis it was found to be a calcareous earth; compared with a soil, it had large supplies of magnesia, phosphoric acid, potash and sulphates. The phosphoric acid was found to be practically available, and nearly 30 per cent. of the potash. The nitrogen is in good proportion but the nitrate present only amounted to a trace. The water soluble material amounted to 2·4 per cent.

"I consider this would form a valuable slow acting manure, well suited to the purpose for which it is used, and it would be worth while importing a ton or two to try the effect in a practical manner."

The suggestion to import a ton or two is being acted upon.

Pests and Diseases.

Specimens of diseased coconut leaflets forwarded to the Government Entomologist were reported on as follows :—"The disease is caused by a Coccid (*Aspidiotus destructor*). This insect is common on coconut fronds in Ceylon, but seldom in sufficient numbers to cause serious injury to the plant. It is kept in check by various enemies, amongst which the most important is a small 'Ladybird' beetle. The specimens received from you have been almost obliterated by this beetle. *Aspidiotus destructor* has been reported as extremely destructive to coconut palms, both in the Laccadive Islands and in the Isle de la Reunion.

A communication having been received from a planter calling attention to the danger of allowing the coconut palms felled for the Puttalam Railway Extension to lie and decay on the ground, in view of their providing suitable breeding places for the coconut beetle, the question was submitted to the Government Entomologist, who, after conferring with the Chief Constructor Engineer, gave his opinion as follows :—"It is not necessary to grub up and destroy the roots of the trees. As the stems are to be used for construction purposes, these will require no further attention for the present. But if used for fencing, they should be discarded and burnt as soon as they show signs of internal decay. The most dangerous part of the tree is the crown, the unripe top of which, being useless for construction purposes, is liable to be left to decay on the ground. Such tops form a prolific breeding ground for the coconut beetle and should be destroyed either by burning, burying, or immersion in water. The leaves themselves may be cut off and allowed to dry up."

The attention of the Government Entomologist having been called to the account (given in the "Philippine Agricultural Review" for March last) of a parasite of the coconut palm, which is reported as likely to prove to be the most serious pest of this crop in the Philippines, Mr. Green wrote :—"*Aleyrodicus destructor* has not yet been recorded from Ceylon. I think that our fumigatorium regulations, which ensure the fumigation of all imported living plants, should be a sufficient safeguard against the introduction of this pest. To make it still surer, I will recommend the inclusion of all coconuts *imported in the husk*."

A number of specimens of diseased coconut leaves submitted to the Government Mycologist were reported on by that officer to be affected by the common coconut leaf disease (*Pestalozzia palmarum*). In reply to a correspondent, he states that it is extremely unlikely that artificial manure has anything to do with the trouble, but on the contrary the general experience is that manured and cultivated trees are less liable to be attacked. He adds that there is no practicable method of combating the disease. Spraying with Bordeaux mixture can only be done at a prohibitive cost, and is not advised except in the case of plants one or two years old very badly attacked.

The Government Entomologist referring to specimens forwarded from Bandaragama Garden of an insect feeding upon the leaves of *Chrysophyllum Roxburghii*, says : "The insect is a caterpillar of a moth (*Euproctis* sp.) ; the specimens were too crushed to admit of exact determination. The caterpillar is unlikely to give any serious trouble."

Mr. Green, reporting on another specimen, says : "The insect said to be damaging orange trees at Panadure is a Coreid bug (*Leptoglossus membranaceus*). It is curious that this same insect has been attracting attention all over the Island within the last three weeks. I have been receiving it from Haputale, Haldummulla, Maskeliya, Kandy and Galle. Everywhere it is accused of damaging vegetable plants and oranges. Hitherto I have always regarded it as a rare and interesting species. The only practicable treatment is to shake the tree over a sheet, collect the fallen insects, and put them into a pail of kerosine and water. Contact poisons strong enough to kill the insects on the trees would be harmful to the foliage."

Sericulture.

The following is Professor Dunstan's report (No. 42,813 of March 20, 1912) on samples of silk produced at the Peradeniya Silk Farm (under the

management of the Salvation Army) forwarded by the Secretary:—
"The samples of silk, which are the subject of this report, were forwarded to the Imperial Institute by the Secretary of the Ceylon Agricultural Society with letter No. 71, dated January 9, 1912.

"The samples, which were stated to have been produced and reeled at the Peradeniya Silk Farm, were as follows:—

"(1) *Product of the Mysore Silkworm.*—This sample weighed ¾ oz. and consisted of a skein of silk of pale fawn colour with a grayish tinge. The silk was clean, but of unsatisfactory colour.

"(2) *Product of a Hybrid between Mysore and Bengal Silkworm.*—This sample weighed ¾ oz. and consisted of a skein of golden-yellow silk with a high lustre resembling that of Italian silk, but rather dirty and specky.

"The silks were examined with the following results:—

Table.	No. 1.	No. 2.
Moisture ...	9·3 per cent. ...	9·9 per cent.
Loss in weight on degumming with a 1 per cent. soap solution	26·1 per cent. ...	21·9 per cent.
Colour and lustre after degumming ...	Pure white and highly lustrous ...	Cream-coloured and highly lustrous
	17 and 19 deniers. Average, 18 deniers (international)	Irregular; 15 to 20 deniers. Average, 17·5 deniers (international)

"The samples were submitted to a firm of spinners, who described them as marketable silks and valued No. 1 at about 12*s*. to 13*s*. per lb., with East Indian Surdah silk at 11*s*. 3*d*. to 11*s*. 9*d*. per lb.

"The spinners expressed their willingness to carry out practical trials with large samples of these silks in order that their value may be accurately ascertained. About 5 lb. or 10 lb. of each variety should therefore be forwarded to the Imperial Institute for submission to the firm."

On inquiry how the values given in Professor Dunstan's report compare with Indian prices, Brigadier Measures of the Salvation Army wrote: "We are now getting in India about 13*s*. 4*d*. for our Mysore silk. About a year ago this was fetching only 10*s*. Now merchants have got to know it, and it is hoped soon to get still better prices."

The Peradeniya Silk Farm exhibits and demonstrations at the All-Ceylon Exhibition in July were among the most interesting features, and attracted large crowds daily.

The Commanding Officer of the Salvation Army in forwarding a sample of thread made of the silk spun by the muga worm (*Antheraea assama*), writes: "The worm likes a damp climate and feeds on various kinds of laurel including the cinnamon. It might therefore do very well in Ceylon. I should appreciate your opinion. Commissioner Booth-Tucker tells me he has 300 maunds of cocoons (say 24,000 lb.) for reeling purposes. Seeing we have so much cinnamon in Ceylon and there is no market of the leaves, it might be easier to get some to start with the

muga worm, and it might add to the profits of the cinnamon growers and indirectly help out that industry as well. We assume that the Assamese muga will relish our cinnamon. We can hardly imagine it having such bad taste as to object! But a small experiment would be easy. The muga silk is much more brilliant than the eri, and is reelable —2 points greatly in its favour. I think the muga feeds on several kinds of leaves besides cinnamon, such as a species of laurel known as 'Soom' (*Machilus odoratissima*), the Champac (*Michelia champaca*), and the Suabi (*Tetranthera monopetala*). I mention the botanical names, as you will know if they are natives of Ceylon, and whether they grow in sufficient quantities for use as a food."

The Government Enotomologist, reporting with reference to the above, points out that the worm is closely allied to the Tussar silkworm, but produces a white and glossier silk, that the eggs are hatched indoors, but the worms are placed on trees outside for feeding, being brought in again when about to spin. He considers it likely that the muga will thrive in Ceylon and that it should certainly be given a trial, remarking that if it feeds upon cinnamon in India it will certainly do so here too and probably also on various species of litsea.

It is proposed to secure eggs to rear the worms locally with a view to ascertaining what local plants it will feed on.

The Commanding Officer, Salvation Army, writing further on the means of popularizing the silk industry, says: "In Hungary the schools and teachers have been made the pivot for spreading information, and now they produce tons of worms and cocoons yearly, and tens of thousands are engaged in the industry. The Jaffna people appear very interested in the industry. Our Peradeniya manager is arranging to spend some time there, visiting the schools and colleges and giving illustrated talks. We are producing a silk diagram card for use in schools. This can be hung on the wall."

Apiculture.

In addition to the exhibits of wild honey in comb and in bottles usually found at local shows, there was a good display of working hives and bee appliances at the All-Ceylon Exhibition in July. The exhibitors were Messrs. A. P. Goonatilleke, J. P. Obeyesekere, J. Victor Perera, and R. E. Dias Bandaranayaka. The two first mentioned exhibitors were awarded silver medals. Mr. A. P. Goonatilleke gave a demonstration in the capturing of a swarm which was witnessed by His Excellency the President and the members of the Agricultural Board.

The comb-foundation machine made for the Society, to meet the requirements of *Apis indica*, by the A. I. Root Co., U. S. A., is now working satisfactorily, thanks to the assistance of Mr. and Mrs. W. Hunter. The machine may be seen at the Government Stock Garden, on application to the Foreman, who will receive orders for comb-connection sheets.

Replying to an inquiry from the Secretary, the manager of Cedara Farm (South Africa) writes: "No pure breed of bees other than the South African native bee exists here. Some years ago one or two, more or less, successful attempts were made to introduce Italians, but they have since died out or hybridized to such an extent that their influence is practically a negative one. Legislation has now been introduced to prohibit the importation of bees and bee appliances that have been used, but allowing the entrance of honey and wax under permit. This has

been done with a view to keeping out foul brood, from which South Africa has so far been entirely free. Our native bee is easy to handle, hardy, a good worker, and in every way entirely suited to our conditions. A tendency to collect an excess of propolis is their weak point, somewhat encouraged by the use of closed-end frames by many bee-keepers."

Mr. E. E. Green, Government Entomologist, remarks that the African bee appears to be a useful species in its own country, but whether it will be equally so in Ceylon is uncertain.

Further inquiries are in progress.

Miscellaneous.

Messrs. Freudenberg & Co. are good enough to state, for the information of a correspondent, that the importations of *Basic Slag* for the past two years were :—For the 12 months ended June 30, 1911, 63,860 cwt., and for the 12 months ended June 30, 1912, 140,000 cwt. (about).

A meeting of headmen and others, presided over by Boyagoda Ratemahatmaya, was held on August 4 in connection with the proposal to start a *Co-operative Credit Bank* for Galboda and Kinigoda korales, and a Committee appointed to draft rules to be considered at a meeting to be convened in September.

The Government Agent, North-Central Province, has asked the Society to take steps to have the *circuit bungalows* in the Anuradhapura District planted up with fruit plants, adding that in his opinion practical operations of this nature are calculated to suggest more ideas to the cultivators than anything else. Mr. Karunanayake, Agricultural Instructor, starts in the course of the month to inspect and report on the gardens referred to.

A meeting of the Kegalla Agricultural Society was held on April 27, at which the Assistant Government Agent (Mr. Codrington) presided, and the chief residents and headmen were present. It was resolved to start *Co-operative Credit Banks* in three centres, and the Secretary was instructed to get the necessary information as to rules and regulations.

On May 27, at a meeting of the Wellaboda pattu (Galle) Agricultural Society, a *Co-operative Credit Society*, of which the Mudaliyar was elected President, was inaugurated, with 4,000 shares of Re. 1 each.

Writing on June 17, Messrs. Freudenberg & Co. sent the following report received from Europe on a sample of soy bean seed (black variety) submitted to them by the Secretary :—The sample sent us has interested a buyer, who inquires as to price F.O.B. Colombo and expects to be able to make an offer for 100 tons."

On being informed that the bean is being grown on a very limited scale, the firm wrote : " We regret you are unable to give us a quotation for 100 tons, and hope that efforts will be made to cultivate the soy bean extensively, with a view to working up a business on a larger scale."

The Secretary received from the Bengal Preserving Co., Muzaffarpur (of which Mr. B. C. Sinha is managing proprietor), a sample tin (1½ lb.) of canned mango, and found the contents in excellent condition, quite equal to the canned fruits in syrup exported from California. This success in India indicates the possibility of canning mangoes and other fruits in Ceylon.

C. DRIEBERG,
Secretary.

Colombo, September 10, 1912.

PADDY CULTIVATION IN CEYLON DURING THE XIXTH CENTURY.

BY E. ELLIOTT.

(*Continued from page 126.*)

Reasons for Increased Production.

The figures already given shew that undoubtedly there has been a great advance in production during the past 50 years; and that as compared with the Bluebook returns for the period (1852-6 immediately before the introduction of the first Paddy Cultivation Ordinance and prior to the early woıks in Sir H. Ward's governorship) the exact increase in the five years ending with 1907 was as follows:—

Average	...	12.7	as against	5.7	Million bushels Paddy.*
Maximum	...	13.8	,, ,,	6.6	,,
Minimum	...	10	,, ,,	5,1	,,

While, however, production has doubled all round, the area cultivated has been extended only 50 %, viz., from an average of 456,000 in 1862-6 to 687,000 in 1903-7; but for purposes of comparison (as already explained in the Chapter on Statistics) production is in Ceylon the real test of progress in growth of paddy.

In this connection it is satisfactory to point out that though there has been a great deficiency in the rainfall during the subsequent three years (1908-10) the crops have only fallen about 8% and averaged as high as 11·2 million bushels paddy and the area cultivated 662,000 acres, showing the small decrease in produce due to unfavourable climatic conditions and not to any want of assiduity on the part of the cultivators.

Effect of Irrigation.

The next step is to investigate the "why and because" of this gratifying state of affairs and discuss the influences which have secured it, and if the abolition of the grain tax has contributed thereto.

If almost goes without saying that Irrigation † has been largely instrumental and may be termed the "first aid" to paddy cultivation; but to test to what extent this is the case, I have prepared an analytical statement after a very careful study of the crop returns and the irrigated area in each province, as follows:

* The crop differed but slightly between 1852 and 66, after the deduction of the increase at Batticaloa, thus:—

The average crop	...	1852-6	was	...	...	5.717	M.B.P.
,, ,, ,,	...	1857-61	,, 6.04	less ·084		5.956	,,
,, ,, ,,	...	1862-6	,, 6.072	,, ·318		5.754	,,

† Irrigation in this connection means the works constructed with the aid of Government, including restored village tanks; and "unirrigated" implies the absence of such works of storage and distribution.

Province.	Average Production in 000 Bushels Paddy.				Total measure aver. 1852=6.†	
	1852-6	1862-6	1888-92	1903-7	1888-92	1903-07
Western ...	944	855	1,685	1,775	741	831
Sabaragamuwa ...	580	505	884	1,465	304	885
Central }	11·98	1052	1242	1,440	654	886
Uva }		406	610	644		
Southern ...	966	909	1536	2,023	570	1057
North-Western ...	967	955	1387	2,114	420	1147
North-Central ...	70	90	470	670	400	600
Eastern ...	272	590	696	1,430	424	1158
Northern ...	720	680	715	733	*5	13
Total. ...	5,717	6,072	9,225	12,294	3,508	6,577

Province.	Portion due to Irrigation.		Balance due to other causes.		Irrigated area.
	1888-92	1903-07	1888-92	1903-07	1906.
Western ...	21	47	720	784	4720
Sabaragamuwa ...	—	45	304	840	4432
Central }	44	235	614	651	6199 }
Uva }					7354 }
Southern ...	335	767	235	290	38,588
North-Western ...	30	739	390	408	104,919
North-Central ...	400	600	—	—	56,905
Eastern ...	424	1158	—	—	56,852
Northern ..	—	120	*5	†107	15,493
Total ...	1,254	3,711	2,254	2.866	295,462

From this comparative table it appears that by the last year of the grain tax (1892) there had been an increase in production of 3½ millions bushels paddy; of which 1¼ millions was due to irrigation and 2½ millions contributed by non-irrigated districts. By 1907 the average increase had reached nearly 6·6 millions of which 3·7 are due to irrigation and 2·9 from non-irrigated lands.

In the latter, the addition in the last 15 years (1893-1907) was only 714, 000 bushels paddy, exclusive of the Jaffna district, where there was a reduction of 102,000 bushels, making the net increase 612,000, of which 465,000 were contributed by Kegalle district alone. There has been no expenditure at all on irrigation works in this district where ordinarily the rainfall is heavy and the crops are usually fair; but when it is moderate the yield is much larger. This has been the case during the last few years, but the production has not exceeded that of 1882 and 1883 under similar climatic conditions.

The Provinces Compared.

In the Western province, there was an increase of 741,000 or 78% prior to 1892 in which year the crops were 2·2 millions bushels paddy, thanks to a heavy rainfall (130") and this has not since been equalled,

* Decrease.

† Includes lands benefitted by village tanks exclusive of Giant's Tank scheme and other works not completed at end of 1906. Owing to this the total differs from that given in General Irrigation return attached to Director's report of 1906.

though the average crop (1903-07) has slightly increased by 90,000 bushels of which 26,000 has to be credited to Irrigation.

In the Central Province and Uva there was an increase of 41% prior to 1892 inclusive of 44,000 due to Irrigation. Of the subsequent advance, 191,000 is due to irrigation, chiefly in Matale, leaving only 41,000 bushels to other causes.

In the Galle district of the Sothern Province the advance up to 1892 was 235,000 bushels or 87% and though the subsequent increase in the average crop of 61,000 (of which 20,000 is due to the Irrigation works at Deduwe, 2,000 acres) the record for the district in 1879 has not been exceeded. In the Matara and Hambantota districts there has been an advance of 235,000 bushels which is entirely attributable to irrigation.

In the Eastern, North-Western and North-Central Provinces there have been very considerable advances in production, which are solely ascribable to the large expenditure on irrigation.

In the Northren Province though the figures show a net advance of 13,000 bushels when the increase in the Vanui, due to irrigation, is allowed for, the result discloses a large reduction in the home Jaffna district during the last period (1903-7). The completion of the Karachchi scheme will doubtless remedy this, provided reasonable terms are offered to attract settlers with small means.

The net increase in non-irrigated districts, exclusive of Kegalle (due to favourable climatic influences in recent years) is consequently about 156,000 bushels or only 2½% on the crops of the period immediately prior to the abolition of the grain tax (1893). The obvious inferences are that this concession has not realised the expectations on which the policy was based, namely, that the import "debarred the community from availing itself to the full of the resources of the soil," was erroneous.

Irrigation on the other hand is to be credited in the same interval with an advance of 2½ million bushels paddy, double what it was in 1892, or 80 per cent. of the subsequent increase. This great share in the development is due to its help, not only in raising the maximum crops in years with an ample rainfall and the minimum in unfavourable years, but to its influence in increasing the average production 50 per cent., as the following statement discloses.

Maximum Years.					Minimum Years.				
Years.	Rain-fall inches	Acres culti-vated in 000.	Crops M.B.P.	Bushels per acre.	Years.	Rain-fall inches.	Acres culti-vated in 000.	Crops M.B.P.	Bushel per acre.
1863	96	474	6·1	12·8	1862	60	478	5·1	10·7
1871	118	443	6·4	14·4	1873	62	531	6	11
1878	114	610	10	16·3	1881	56	549	7·3	13·3
1890	106	536	9	16·8	1893	63	546	9·3	17·2
1897	107	627	11·5	17	1902	73	702	12·7	18
1903	114	716	13·7	19	1907	66	674	11·5	17

Subsidiary Causes.

Amongst the subsidiary causes which have contributed to this gratifying expansion is the avidity with which all natives of Ceylon avail themselves of facilities of acquiring land, especially when it is suitable for paddy cultivation, such as the instalment system of payment in four

years authorised by Sir H. Ward at, I believe, Woodford Birch's suggestion. Again, the wise policy of issuing permits on easy terms for the *aswedumising* of Crown land previous to survey and sale, fostered much early development, especially at Batticaloa and Tissa, enabling the improvers to buy outright when exposed to sale and at the same time securing better prices to the Government than if sold as waste land.

The great rise in the price of rice and consequently of Ceylon grown paddy in the sixties and subsequently was also a powerful incentive to additional production, while the failure of native coffee very probably impelled many to fall back on paddy, especially in the Central Province and Uva.

It will now be interesting to enquire what has been the cost of securing the development which may be ascribed to the irrigation works executed during the half century in which the advance has occurred. (1857-1907.)

COCOA WORK IN THE WEST INDIES.

Mr. A. W. Hill contributes to the Kew Bulletin a long account, more or less in the form of a diary, of a visit to the West Indies early this year as representative of the Royal Botanic Gardens, Kew.

Mr. Hill's view of things is naturally that of the Botanical enthusiast, but there is much valuable agricultural information to be culled from his contribution.

Cocoa is par excellence the crop of the West Indies and we are, therefore, not surprised to find a great deal that should interest local planters concerning this crop.

Cocoa Grafting.

Mr. Hill bears high testimony to the value of Mr. J. Jones work in Dominica in connection with cocoa-grafting. The grafted trees are young, but their low-growing and spreading habit in contrast to the more fastigiate character of the bushes raised from seed, is striking. The grafted plant is produced from a lateral branch section and may be compared in its growth to a broad-based cone standing on its base, while the seedling resembles rather a cone standing on its apex. The grafted tree would appear to offer several advantages over the seedling, though it is sometimes asserted that we are not yet in a position fully to realise the value of grafting.

(1.) It makes it possible to have a plantation devoted to one variety of Cacao alone. This is a matter of considerable value since uniformity in the beans brought in for curing could be secured and a uniform product should result. At present, owing to the mixed crop comprising beans of different varieties, a good deal of difficulty is experienced in adjusting the time of fermentation and regulating the drying and curing processes, and as a consequence uniformity of the sample is often lost.

(2.) By using different varieties for grafting it would be possible to arrange a succession of plots ripening at different times and also the crop time might be slightly lengthened.

(3.) The habit of growth of the plant tends to shade the ground and so to prevent loss of water by evaporation. It would appear as far as can be seen that the picking of the pods would be a much easier process than it is in the case of the higher branches of the tall trees grown from seedlings, and that therefore injury from bad picking should be reduced to a minimum.

Hybridisation: Pests and Treatment.

Interesting experiments in hybridising are also in progress at Dominica Botanic Station, and a cross has been secured between the Alligator Cacao (*Theobroma pentagona*) which has large beans, and a hardy variety of Forastero. The experiment may lead to results of considerable scientific and economic importance.

The discussion on cocoa at the conference held in Trinidad on January 23rd turned chiefly on the fungoid and insect pests attacking the crop.

Mr. Rorer demonstrated that both the pod rot and stem canker of cocoa was due to *Phytophthora Faberi.* Mr. Guppy demonstrated the method of trapping cocoa beetles by means of pieces of the branch of the wild chataigne (*Pachira aquatica*), a tree particularly attractive to the beetles, and therefore not to be grown near a Cocoa estate.

The value of spraying as a control of both insect and fungoid pests was strongly advocated; the use of different types of nozzle was demonstrated, and suitable forms of apparatus for use on hilly plantations also exhibited.

Cocoa Forest of Tobago.

Mr. Hill describes his penetrating into the cocoa forest near Tobago, where he saw trees from 50 to 100 ft. high looking more like huge palms with a crest of branches at the top. Seeds dropped beneath had sprouted producing seedlings like fishing rods 40 to 50 ft. long, with but a few leaves on the top.

Mr. Hill pays a tribute to the work of the Department of Agriculture under Dr. Watts's direction, and remarks that the centralization of the small local departments, so successfully effected by Sir Daniel Morris, has been the means of helping forward, very materially, the general prospects of the smaller Islands.

COTTON CULTIVATION IN INDIA.

The British Cotton Growing Association has issued a pamphlet embodying correspondence *re* Cotton Growing in India, wherein we find an interesting note by the Officiating Inspector-General of Agriculture. The latter summarises the work done by the Department of Agriculture under the following heads—(1) Survey of indigenous varieties, (2) Selection and distribution of seed, (3) Hybridisation, (4) Introduction of exotic varieties to likely areas, (5) Trial of tree cotton, (6) Introduction of superior local varieties to other likely localities, (5) Improved methods of cultivation, (8) Extension of cultivated areas.

With the exception of the trials with tree cotton which have failed and have consequently been given up, work under all the heads have been continuous and progressive.

The Director-General is not disposed to recommend that Government should for the present take up any new line of work for improving quantity and quality, but is strongly of opinion that for the production of finer cotton it is essential that agencies should be set up for buying, ginning, baling and exporting long staple cotton with a view to establishing a market for such produce from India, so that the cultivator may get a fair price at his door.

Cotton grown in Tinnevelly from American seed has been reported as suitable for a considerable class of goods produced in Lancashire which it is stated could use 500,000 bales per annum.

MARKET RATES FOR TROPICAL PRODUCTS.

(From Lewis & Peat's Monthly Prices Current, London, 17th July, 1912.)

	QUALITY.	QUOTATIONS.
ALOES, Socotrine cwt.	Fair to fine ...	65s a 70s
Zanzibar & Hepatic ,,	Common to good ..	50s a 82s 6d
ARROWROOT (Natal) lb.	Fair to fine ..	8d a 9d
BEES' WAX, cwt.		
Zanzibar Yellow ,,	Slightly drossy to fair ..	£7 a £7 2/6
East Indian, bleached ,,	Fair to good	£7 17/6 a £8 2/6
,, unbleached ,,	Dark to good genuine ..	£5 17/6 a £6 10s
Madagascar ,,	Dark to good palish	£6 17s 6d a £7 5s
CAMPHOR, Japan ,,	Refined	1s 6d a 1s 8½d
China ,,	Fair average quality ..	155s
CARDAMOMS, Tuticorin	Good to fine bold	4s 8d a 5s 2d
	Middling lean	4s a 4s 5d
Malabar, Tellicherry	Good to fine bold ..	4s 11d a 5s 5d
Calicut	Brownish .	4s 4d a 4s 9d
Mangalore ,,	Med brown to fair bold	4s 6d a 5s 8d
Ceylon, Mysore ,,	Small fair to fine plump	3s 8d a 5s 4d
Malabar ..	Fair to good ..	3s 7d a 3s 10d
Seeds, E. I. & Ceylon ,,	Fair to good .	4s a 4s 1d
Ceylon Long Wild ,,	Shelly to good ..	1s a 2s 9d
CASTOR OIL, Calcutta ,,	Good 2nds .	4d a 4½d
CHILLIES, Zanzibar cwt.	Dull to fine bright ...	40s a 45s
Japan ,,	Fair bright small ..	28s 6d a 32s 6d
CINCHONA BARK.—lb.	Crown, Renewed	3⅜d a 7d
Ceylon	Org. Stem	2d a 6d
	Red Org. Stem	1¾d a 4¼d
	Renewed	3d a 5¼d
	Root	1⅞d a 4d
CINNAMON, Ceylon 1sts	Good to fine quill	1s 3d a 1s 7d
per lb. 2nds	,, ,,	1s 4d a 1s 6d
3rds	,, ,,	1s a 1s 5d
4ths	,, ,,	1s a 1s 4d
Chips, &c..	Fair to fine bold	2d a 3d
CLOVES, Penang lb.	Dull to fine bright pkd.	11d a 1s 1d
Amboyna ..	Dull to fine	9d a 10d
Ceylon ..	,, ,,	7½d a 9d
Zanzibar	Fair and fine bright	7⅝d a 7¼d
Stems ..	Fair	2½d
COFFEE		
Ceylon Plantation cwt.	Medium to bold	80s a 113s
Native	Good ordinary	Nominal
Liberian ,,	Fair to bold	75s a 85s
COCOA, Ceylon Plant. ,,	Special Marks	77s a 90s
	Red to good	69s a 76s
Native Estate ,,	Ordinary to red	42s a 70s
Java and Celebes ,,	Small to good red	25s a 80s
COLOMBO ROOT ,,	Middling to good	10s a 15s
CROTON SEEDS, sift. cwt.	Dull to fair	70s a 75s nom.
CUBEBS ,, ,,	Ord. stalky to good	150s a 170s nom.
GINGER, Bengal, rough ,,	Fair	35s nom.
Calicut, Cut A ,,	Small to fine bold	82s 6d a 85s
B & C ,,	Small and medium	65s a 80s
Cochin Rough ,,	Common to fine bold	38s a 42s 6d
	Small and D's	37s 6d
Japan ,,	Unsplit	29s
GUM AMMONIACUM ,,	Ord. blocky to fair clean	40s a 72s 6d
ANIMI, Zanzibar	Pale and amber, str. srts	£12 10s a £14 5s
	,, ,, little red	£11 a £12
	Bean and Pea size ditto	75s a £9 10s
	Fair to good red sorts	£7 a £9
	Med. & bold glassy sorts	£5 a £8
Madagascar ,,	Fair to good palish ...	£4 a £8 15s
	,, ,, red ...	£4 a £7 10s
ARABIC E. I. & Aden ,,	Ordinary to good pale	35s a 45s nom.
Turkey sorts ,,		42s 6d a 65s
Ghatti ,,	Sorts to fine pale ...	25s a 35s nom.
Kurrachee ,,	Reddish to good pale ...	27s 6d a 35s ,,
Madras ,,	Dark to fine pale ..	27s 6d a 35s ,,
ASSAFŒTIDA ,,	Clean fr. to gd. almonds	£10 a £12
	com. stony to good block	50s a £9
KINO	Fair to fine bright	6d a 1s
MYRRH, Aden sorts cwt	Middling to good	52s 6d a 62s 6d
Somali ,,	,, ,,	50s a 52s 6d
OLIBANUM, drop ,,	Good to fine white	45s a 60s
	Middling to fair	35s a 40s
pickings ,,	Low to good pale	12s 6d a 27s 6d
siftings ,,	Slightly foul to fine	20s a 22s 6d
INDIA RUBBER lb.	Fine Para bis. & sheets	4s 10½d
	,, Ceara ,, ,,	4s 9d
Ceylon, Straits, Malay Straits, etc.	Crepe ordinary to fine..	4s 10d a 5s 1½d
	Fine Block ..	4s 11½d
	Scrap fair to fine ..	3s 11d a 4s 2d
Assam	Plantation ..	4s
	Fair II to ord. red No. 1	3s 4d a 3s 9½d
Rangoon	,, ,, ,,	2s a 3s

	QUALITY.	QUOTATIONS
INDIARUBBER. *(Contd.)*		
Borneo	Common to good	1s 9d a 2s 9d
Java	Good to fine red .	3s 6d a 3s 8d
Penang	Low white to prime red	1s 6d a 2s 8d
Mozambique	Fair to fine red ball ...	3s 10d a 4s 6d
	Sausage, fair to good ..	3s 6d a 4s 5d
Nyassaland	Fair to fine ball ..	3s a 4s
Madagascar	Fr to fine pinky & white	2s 9d a 3s 4d
	Majunga & blk coated ..	2s a 2s 6d
	Niggers, low to good ..	6d a 3s 3d
New Guinea	Ordinary to fine ball ..	2s 6d a 3s 6d
INDIGO, E.I. Bengal	Shipping mid to gd violet	3s 2d a 3s 8d
	Consuming mid. to gd.	2s 6d a 3s
	Ordinary to middling	2s 3d a 2s 6d
	Oudes Middling to fine	2s 6d a 2/8 nom.
	Mid. to good Kurpah	2s 2d a 2s 6d
	Low to ordinary	1s 6d a 2s
	Mid. to fine Madras	None here
MACE, Bombay & Penang	Pale reddish to fine	2s 6d a 2s 8d
per lb.	Ordinary to fair	2s 2d a 4d
Java	,, ,, good pale	2s 4d a 2s 8d
Bombay	Wild	7d a 8d
MYRABOLANES, cwt	UG and Coconada	4s 9d a 5s 6d
Bombay ,,	Jubblepore	4s 10½d a 7s
	Bhimlies	4s 10½d a 7s 3d
	Rhajpore, &c.	4s 6d a 6s
Bengal ,,	Calcutta	4s a 5s
NUTMEGS— lb.	64's to 57's	10d a 1s
Singapore & Penang ,,	80's	7d
	110's	5½d
NUTS, ARECA cwt.	Ordinary to fair fresh	14s a 15s
NUX VOMICA, Cochin	Ordinary to good	9s 6d a 12s 6d
per cwt. Bengal	,, ,,	8s 6d
Madras	,, ,,	8s 6d a 9s
OIL OF ANISEED ,,	Fair merchantable	5s 10d
CASSIA ,,	According to analysis	3s 5d a 3s 8d
LEMONGRASS ,,	Good flavour & colour	4½d
NUTMEG ,,	Dingy to white	1¼d a 1¾d
CINNAMON ,,	Ordinary to fair sweet	2⅝d a 1s 4d
CITRONELLE ,,	Bright & good flavour	1s 4d
ORCHELLA WEED—cwt		
Ceylon ,,	Fair ..	10s Nom.
Madagascar ,,	Fair ...	10s ,,
PEPPER—(Black) lb.		
Alleppy & Tellicherry	Fair ...	5⅝d a 5¾d
Ceylon ,, ,,	,, to fine bold heavy ..	5½d a 5⅞d
Singapore ..	Fair	5⅝d
Acheen & W. C. Penang	Dull to fine	5½d a 6d
(White) Singapore ,,	Fair to fine	8¾d a 9d
Siam ,,	Fair	8½d
Penang ,,	Fair	8d
Muntok ,,	Fair	9⅛d
RHUBARB, Shenzi ..	Ordinary to good ..	1s 11d a 3s 3d
Canton ..	Ordinary to good ..	1s 8d a 2s 2d
High Dried..	Fair to fine flat ...	1s a 1s 2d
	Dark to fair round ..	9d a 10d
SAGO, Pearl, large ...	Fair to fine	18s a 19s
medium ..	,, ,,	17s a 18s 6d
small ...	,, ,,	14s 6d a 15s
SEEDLAC cwt.	Ordinary to gd. soluble	45s a 60s
SENNA, Tinnevelly lb.	Good to fine bold green	5d a 8½d
	Fair greenish	3d a 4½d
	Common speckyand small	1¼d a 2½d
SHELLS, M. o'PEARL—		
Egyptian cwt.	Small to bold ...	95s a £10 7s 6d
Bombay ,,	,, ,, ...	62s 6d a £11 10s
Mergui ,,	,, ,, ..	£15 15s a £19 5s
Manilla ,,	Fair to good £	13 12/6d a £17 5s
Banda ,,	Sorts	57s 6d a 75s
TAMARINDS, Calcutta..	Mid. to fine bl'k not stony	9s a 12s
per cwt. Madras	Stony and inferior ..	4s a 5s
TORTOISESHELL—		
Zanzibar, & Bombay lb.	Small to bold ..	15s a 34s
	Pickings ..	13s 6d a 25s
TURMERIC, Bengal cwt.	Fair	22s
Madras ,,	Finger fair to fine bold [bright	24s a 26s
Do. ,,	Bulbs	18s a 20s
Cochin ,,	Finger fair ..	20s
	Bulbs ..	10s
VANILLOES— lb.		
Mauritius .. 1sts	Gd crystallized 3½ a 8½ in	13s 6d a 18s 6d
Madagascar ... 2nds	Foxy & reddish 3½ a ,,	13s a 16s
Seychelles .. 3rds	Lean and inferior ..	12s 6d a 13s 6d
VERMILLION ..	Fine, pure, bright	2s 11d
WAX, Japan, squares	Goodhite hard ...	46s